# FLIGHT INSTRUCTOR

# QUESTION BOOK

1986

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Aviation Standards National Field Office

## MAXIMUM TIME ALLOWED FOR TEST:

A. Flight Instructor — Airplane: 4 Hours
— Glider: 4 Hours
— Helicopter: 4 Hours
— Gyroplane: 4 Hours

B. Flight Instructor — Additional Rating — Airplane: 2 Hours
— Helicopter: 2 Hours
— Gyroplane: 2 Hours

Materials to be used with this question book when used for airman testing:

1. Airman Written Test Application which includes the answer sheet.
2. Question Selection Sheet which identifies the questions to be answered.
3. Plastic overlay sheet which can be placed over performance charts for plotting purposes.

## GENERAL INSTRUCTIONS FOR TAKING THE TEST

1. Read the instructions on page 1 of the Airman Written Test Application and complete page 4 of the form.

2. The question numbers in this question book are numbered consecutively beginning with No. 3001. Refer to the question selection sheet to determine which questions to answer.

3. For each item on the answer sheet, find the appropriate question in the book.

4. Mark your answer in the space provided for that item on the answer sheet.

5. Remember:

   Read each question carefully and avoid hasty assumptions. Do not answer until you understand the question. Do not spend too much time on any one question. Answer all of the questions that you readily know and then reconsider those you find difficult. Be careful to make necessary conversions when working with temperatures, speeds, and distances.

If a regulation or operations procedure is changed after this question book is printed, you will receive credit until the affected questions are revised.

**THE MINIMUM PASSING GRADE IS 70.**

## WARNING

**§ 61.37 Written tests: cheating or other unauthorized conduct.**

(a) Except as authorized by the Administrator, no person may—

(1) Copy, or intentionally remove, a written test under this Part;

(2) Give to another, or receive from another, any part of copy of that test;

(3) Give help on that test to, or receive help on that test from, any person during the period that test is being given;

(4) Take any part of that test in behalf of another person;

(5) Use any material or aid during the period that test is being given; or

(6) Intentionally cause, assist, or participate in any act prohibited by this paragraph.

(b) No person whom the Administrator finds to have committed an act prohibited by paragraph (a) of this section is eligible for any airman or ground instructor certificate or rating, or to take any test therefor, under this chapter for a period of one year after the date of that act. In addition, the commission of that act is a basis for suspending or revoking any airman or ground instructor certificate or rating held by that person.



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## PREFACE

This book was developed by the Federal Aviation Administration to be used by Federal Aviation Administration testing centers and Federal Aviation Administration designated written test examiners when administering Flight Instructor — Airplane, — Glider, — Helicopter, or — Gyroplane Written Tests. It is also used to administer Flight Instructor — Airplane or — Rotorcraft additional rating written tests.

Flight instructor applicants may use this book as a study guide. It is issued as FAA-T-8080-3A, Flight Instructor Question Book and is available from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

or from U.S. Government Printing Office Bookstores located in major cities throughout the U.S.

The questions included in this publication are predicated on regulations, principles, and practices that were valid at the time of publication. The question selection sheets prepared for use with this question book are security items and are revised at frequent intervals.

The Federal Aviation Administration does not supply the correct answers to questions included in this book. Students should determine the answers by research and study, by working with instructors, or by attending ground schools. The Federal Aviation Administration is NOT responsible for either the content of commercial reprints of this book or the accuracy of the answers they may list.

Comments regarding this publication should be directed to:

U.S. Department of Transportation
Federal Aviation Administration
Aviation Standards National Field Office
Examinations Standards Branch, AVN-130
P.O. Box 25082
Oklahoma City, Oklahoma 73125

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# FLIGHT INSTRUCTOR QUESTION BOOK

## INTRODUCTION

This book follows the new concept in presenting Federal Aviation Administration written tests to flight instructor applicants. Under this new concept, aeronautical knowledge subjects appropriate to four flight instructor rating areas (airplane, glider, gyroplane, and helicopter) are included in this book. Question selection sheets are used to administer the proper written test to each applicant. Each test is constructed from the 507 test questions included in Appendix I.

The planned revision cycle is 24 months for the question book and 12 months for the associated question selection sheets. Each question book and selection sheet is dated to indicate its expiration date.

## THE WRITTEN TEST

### Questions and Scoring

The test questions are of the multiple–choice type. Answers to questions listed on the question selection sheet should be marked on the answer sheet of AC Form 8080–3, Airman Written Test Application Directions should be read carefully before beginning the test. Incomplete or erroneous personal information entered on this form delays the scoring process.

The answer sheet is sent to the Mike Monroney Aeronautical Center in Oklahoma City where it is scored by computer. Shortly thereafter AC Form 8080–2, Airman Written Test Report, is sent to the applicant listing the score and test questions missed.

When reporting for a flight test, the applicant must present this form and be prepared to discuss those questions missed. This form must also be presented when retesting is required in the event of a written test failure.

### Taking the Test

The test may be taken at Federal Aviation Administration testing centers, Federal Aviation Administration written test examiner's facilities, or other designated places. After completing the test, the applicant must surrender the issued question book, question selection sheet, answer sheet, and any papers used for computations or notations, to the monitor before leaving the test room.

When taking the test, the applicant should keep the following points in mind:

1. Answer each question in accordance with the latest regulations and procedures.
2. Read each question carefully before looking at the possible answers. You should clearly understand the problem before attempting to solve it.
3. After formulating an answer, determine which of the alternatives most nearly corresponds with that answer. The answer chosen should completely resolve the problem.
4. From the answers given, it may appear that there is more than one possible answer; however, there is only one answer that is correct and complete. The other answers are either incomplete or are derived from popular misconceptions.
5. If a certain question is difficult for you, it is best to proceed to other questions. After the less difficult questions have been answered, return to those which gave you difficulty. Be sure to indicate on the question selection sheet the questions to which you wish to return.
6. When solving a computer problem, select the answer nearest your solution. The problem has been checked with various types of computers; therefore, if you have solved it correctly, your answer will be closer to the correct answer than to any of the other choices.
7. To aid in scoring, enter personal data in the appropriate spaces on the test answer sheet in a complete and legible manner. Enter the test number printed on the question selection sheet.

### Retesting—FAR 61.49

Applicants who receive a failing grade may apply for retesting by presenting their AC Form 8080–2, Airman Written Test Report—

> (1) after 30 days from the date the applicant failed the test; or
> (2) in case of the first failure, the applicant may apply for retesting before the 30 days have expired upon presenting a written statement from an authorized instructor certifying that the instructor has given ground instruction to the applicant and finds the applicant competent to pass the test.

**NOTE:** Blank spaces appear on several pages of this publication. This permits referenced figures and tables to appear as close as possible to their related questions.

## APPENDIX 1

**3001.** A person whose flight instructor certificate has been suspended may not

1—give flight instruction for compensation, but may recommend students for certification.
2—apply for any rating to be added to that certificate during the period of suspension.
3—give flight instruction, but may apply for a rating to be added to that certificate.
4—apply for any flight instructor certificate for a period of 1 yr. after the date of the suspension.

**3002.** What is the duration of a student pilot certificate?

1—Indefinite.
2—12 calendar months.
3—24 calendar months.
4—36 calendar months.

**3003.** What is the duration of a flight instructor certificate?

1—Indefinitely, unless suspended or revoked.
2—24 calendar months.
3—Indefinitely, as long as the holder has a current pilot and medical certificate appropriate to the pilot privileges being exercised.
4—12 calendar months.

**3004.** To be eligible (in part) to take an FAA airman certification written test, an applicant must show proof of

1—enrollment in an approved course of training.
2—meeting the minimum age requirement for the issuance of the certificate being sought.
3—medical qualification appropriate to the certificate being sought.
4—satisfactory completion of a ground instruction or home study course.

**3005.** A person who has cheated or committed any unauthorized act during a written test may not take any written test within

1—90 days.
2—6 mo.
3—1 yr.
4—2 yr.

**3006.** What action may be taken against a person who has cheated on a written test?

1—That person may be required to wait a maximum of 6 mo. before taking any written test.
2—That person may be required to wait a maximum of 90 days before taking any written test.
3—That person may be required to wait 24 mo. before taking any written test.
4—Any airman certificate or rating held may be suspended or revoked.

**3007.** To be eligible for a flight test, an applicant is required to have passed the appropriate written test within the preceding

1—12 calendar months.
2—18 calendar months.
3—24 calendar months.
4—36 calendar months.

**3008.** What class medical certificate, if any, is required for a person adding a rating to a commercial pilot certificate?

1—None.
2—First class.
3—Second class.
4—Third class.

**3009.** Each applicant who wishes to take a private pilot flight test is required, in part, to show proof of

1—meeting the minimum age requirement.
2—enrollment in an approved course of training.
3—recent takeoff and landing experience requirements.
4—meeting the minimum night flying experience requirements.

**3010.** What minimum written statement from an appropriately rated flight instructor is required when recommending an applicant for a private pilot flight test?

1—A statement of flight instruction given within the preceding 60 days in preparation for the flight test stating the applicant is competent to pass the test and has satisfactory knowledge of the subject areas which were shown to be deficient on the FAA written test report.
2—A statement that the required instruction was given in the areas shown to be deficient on the FAA written test report and a signed application of recommendation dated within the preceding 90 days.
3—A signed application of recommendation dated within the preceding 90 days.
4—A statement certifying that the required flight instruction in preparation for the flight test was given within the preceding 120 days.

**3011.** A written statement from an appropriately rated flight instructor certifying that an applicant has received the required instruction in preparation for a flight test must be dated within a minimum of how many days preceding the date of application?

1—60 days.
2—90 days.
3—120 days.
4—180 days.

**3012.** An applicant has failed a pilot written test for the second time. That applicant may apply for a retest after how many days?

1—5.
2—7.
3—10.
4—30.

**3013.** An applicant who fails a pilot flight test for the second time may apply for a retest after

1—receiving 5 hr. of dual instruction.
2—7 days have passed.
3—presenting a letter of competency to the examiner.
4—30 days have passed.

**3014.** Which instruction time must be certified by the instructor from whom it was received?

1—Flight instruction only.
2—Ground instruction only.
3—Flight instruction, pilot ground trainer instruction, and ground instruction.
4—Flight instruction and ground trainer instruction only.

**3015.** A flight instructor who has not satisfactorily accomplished a Biennial Flight Review or passed a required proficiency check within the prescribed time is

1—authorized to fly solo only.
2—authorized to act as pilot in command, but not for compensation.
3—not authorized to fly solo.
4—not authorized to give instruction except to holders of private pilot certificates.

**3016.** A person seeking a private pilot glider rating is exempt from taking the written examination if that person

1—has taken a written examination for any powered rating within the preceding 12 mo.
2—has taken a written examination for any powered rating within the preceding 24 mo.
3—holds a pilot certificate for any category.
4—holds a rating for powered aircraft.

**3017.** To be eligible for a student pilot certificate limited to airplanes, an applicant is required to be at least how old?

1—16 yr.
2—17 yr.
3—18 yr.
4—19 yr

**3018.** An applicant who is seeking a student pilot certificate limited to helicopters is required to be at least how old?

1—16 yr.
2—17 yr.
3—18 yr.
4—19 yr.

**3019.** What is the minimum age requirement for the applicant who is seeking a student pilot certificate limited to gyroplane operations?

1—14 yr.
2—16 yr.
3—17 yr.
4—18 yr.

**3020.** The minimum age requirement for the applicant who is seeking a student pilot certificate limited to glider operations is

1—14 yr.
2—15 yr.
3—16 yr.
4—17 yr.

**3021.** Prior to solo, a student must have received flight and ground instruction in

1—night flying, including takeoffs, landings, and VFR navigation.
2—crosswind takeoffs and landings.
3—airport traffic patterns, including collision avoidance precautions and wake turbulence.
4—flight maneuvering by reference to ground objects.

**3022.** Which is a required endorsement by an authorized flight instructor for a student pilot to operate an aircraft in solo flight?

1—An endorsement made within the preceding 180 days that instruction was given in the make of aircraft to be soloed and that the instructor found the applicant competent to make a safe flight in that aircraft.
2—An endorsement must have been made on the student pilot certificate within the preceding 6 mo.
3—An endorsement that instruction was given in the make and model of aircraft to be soloed within the preceding 6 mo.
4—An endorsement within the preceding 90 days stating that instruction was given in the make and model and the student is competent to fly that aircraft solo.

**3023.** Prior to a first solo flight, the flight instructor is required to endorse the student's

1—logbook and pilot certificate.
2—logbook only.
3—medical certificate and pilot certificate.
4—pilot certificate only.

**3024.** A student is required to have his/her pilot certificate endorsed by a flight instructor for each

1—solo flight.
2—solo cross-country flight.
3—make and model of aircraft to be flown solo.
4—passenger-flight.

**3025.** A student pilot who wishes solo privileges in a certain make and model aircraft is required to first

1—pass a written test about that aircraft.
2—get a flight instructor endorsement for that aircraft.
3—receive at least 5 hr. of dual instruction in that aircraft.
4—receive at least one dual cross-country flight in that aircraft.

**3026.** A student pilot with no cross-country training may practice solo takeoffs and landings at an airport within what maximum distance from the departure airport?

1—10 NM.
2—15 NM.
3—25 NM.
4—50 NM.

**3027.** A student pilot whose pilot certificate is not endorsed by a flight instructor to make solo cross-country flights is prohibited from flying solo beyond what distance from the point of takeoff?

1—15 NM.
2—20 NM.
3—25 NM.
4—50 NM.

**3028.** Are students authorized to make repeated solo cross-country flights without each flight being logbook endorsed?

1—No. Each solo cross-country flight requires a logbook endorsement.
2—Yes. Solo cross-country flights require no logbook endorsement.
3—Yes, but only if the flights remain within 25 NM of the point of depa ure.
4—Yes, provided the flights take place under stipulated conditions.

**3029.** One requirement for a student pilot to be authorized to make a solo cross-country flight is an endorsement

1—on the student pilot certificate stating the student is competent to make cross-country solo flights in the category, class, and type of aircraft involved.
2—in the student's logbook stating the instructor has given the student dual instruction over the route to be flown.
3—in the student's logbook that the preflight planning and preparation has been reviewed and the student is prepared to make the flight safely.
4—in the student's logbook that the instructor has given the student cross-country instruction in the model of aircraft to be used.

**3030.** May repeated solo cross-country flights over the same route be made by a student without receiving an endorsement from a flight instructor for each flight?

1—No; an endorsement is required for each solo cross-country.
2—Yes; if the route is no more than 50 NM from the point of departure and instruction was given in both directions over the route.
3—Yes; if the total route is no more than 25 NM from the point of departure and the student has received at least 3 hr. of cross-country instruction and logged at least 5 hr. of solo cross-country.
4—Yes; but the distance from the departure point is limited to 100 NM.

**3031.** What is the minimum age required to be eligible for a private pilot certificate with an airplane rating?

1—14.
2—16.
3—17.
4—18.

**3032.** To be eligible for a private pilot certificate, one of the requirements is for the applicant to hold at least a current

1—Fourth-Class Medical Certificate.
2—Third-Class Medical Certificate.
3—Second-Class Medical Certificate.
4—First-Class Medical Certificate.

**3033.** What night flight instruction is required for an unrestricted private pilot certificate with an airplane rating?

1—1 hr. at night, including three takeoffs and three landings.
2—1 hr. at night, including five takeoffs and five landings.
3—3 hr. at night, including 10 takeoffs and 10 landings.
4—5 hr. at night, including five takeoffs and five landings.

**3034.** With respect to cross-country experience requirements of FAR Part 61, a private pilot airplane applicant must have a minimum of

1—3 hr. dual and 5 hr. solo.
2—3 hr. dual and 10 hr. solo.
3—5 hr. dual and 5 hr. solo.
4—5 hr. dual and 10 hr. solo.

**3035.** What flight time is required for a private pilot certificate with a helicopter rating?

1—A minimum of 40 hr of flight instruction and solo flight time in aircraft with at least 15 hr. of solo time in helicopters.
2—A minimum of 40 hr. of flight time in aircraft with at least 15 hr. of flight instruction in helicopters.
3—A minimum of 40 hr. in helicopters with at least 15 hr. of solo time.
4—A minimum of 40 hr. of flight time with at least 10 hr. of solo time in helicopters.

**3036.** How much solo time in a gyroplane is required to be eligible for a private pilot certificate with a gyroplane rating?

1—5 hr.
2—10 hr.
3—15 hr.
4—20 hr.

**3037.** What is the minimum age required to be eligible for a commercial pilot certificate?

1—16.
2—17.
3—18.
4—21.

**3038.** To be eligible for a commercial pilot certificate, one of the requirements is for the applicant to hold at least a current

1—First–Class Medical Certificate.
2—Second–Class Medical Certificate.
3—Third–Class Medical Certificate.
4—Fourth–Class Medical Certificate.

**3039.** As a pilot, how much flight time should an applicant have for a commercial pilot certificate with an airplane rating?

1—250 hr.
2—200 hr.
3—150 hr.
4—100 hr.

**3040.** Under FAR Part 61, a commercial pilot – airplane applicant is required to have a minimum of how much cross–country experience?

1—20 hr.
2—30 hr.
3—40 hr.
4—50 hr.

**3041.** As pilot, how much flight time should an applicant have for a commercial pilot certificate with a helicopter rating?

1—250 hr.
2—200 hr.
3—150 hr.
4—100 hr.

**3042.** As pilot, how much flight time should an applicant have for a commercial pilot certificate with a gyroplane rating?

1—250 hr.
2—200 hr.
3—150 hr.
4—100 hr.

**3043.** An applicant for a commercial pilot certificate with a glider rating must have at least

1—25 hr. pilot time, 20 hr. in gliders, and 100 glider flights as pilot in command, including 25 flights in which 360° turns were made.
2—200 hr. of pilot time in heavier–than–air aircraft, including at least 10 glider flights as pilot in command during which 360° turns were made.
3—40 hr. of flight time in gliders and single–engine airplanes, including 10 solo glider flights.
4—35 glider flights launched by ground tow or 20 launched by aero tow.

**3044.** What requirement must a certified flight instructor meet in order to prepare an applicant for a flight instructor rating?

1—A minimum of 100 hr. of flight instructor time.
2—Have held a flight instructor certificate for at least 12 mo.
3—Have held a flight instructor certificate for at least 24 mo. and given a minimum of 200 hr. of flight instruction.
4—Have held a flight instructor certificate for at least 24 mo. and given a minimum of 500 hr. of flight instruction.

**3045.** What requirement must a certified flight instructor meet in order to prepare an applicant for a flight instructor rating?

1—Have held a flight instructor certificate for at least 24 mo. and given a minimum of 80 hr. of instruction.
2—Have held a flight instructor certificate for 24 mo. or have given 200 hr. of flight instruction.
3—A minimum of 200 hr. as a flight instructor.
4—Have held a flight instructor certificate for 12 mo. and given a minimum of 80 hr. of instruction.

**3046.** The type and date of each student pilot endorsement given shall be maintained by each flight instructor. For what period of time is this record required to be maintained?

1—6 mo.
2—12 mo.
3—24 mo.
4—36 mo.

**3047.** A flight instructor who applies for an additional rating on that certificate must have a minimum of how many hours as pilot in command in the category and class of aircraft appropriate to the rating sought?

1—20 hr.
2—15 hr.
3—10 hr.
4—5 hr.

**3048.** During any 24 consecutive hours, an instructor is limited to how many hours of flight instruction?

1—6.
2—8.
3—10.
4—12.

**3049.** To endorse a student pilot for solo cross-country privileges, an instructor is required, in part, to have

1—at least 5 hr. of experience as pilot in command in the aircraft involved.
2—given at least 200 hr. of flight instruction.
3—given that student the required cross-country flight instruction.
4—assurance from another instructor that the student is prepared to conduct the flight safely.

**3050.** To endorse a student pilot's logbook for local solo flight, an instructor is required, in part to have

1—given that student flight instruction in the type of aircraft involved.
2—given at least 200 hr. of flight instruction.
3—at least 5 hr. of experience as pilot in command in the aircraft involved.
4—given that student cross-country flight instruction.

**3051.** To authorize a student to make a local solo flight, the instructor is required, in part, to

1—have at least 5 hr. of experience as pilot in command in the aircraft involved.
2—have given that student cross-country flight instruction.
3—first give that student at least 3 hr. of instrument training.
4—endorse the student's pilot certificate for solo in the make and model aircraft to be flown.

**3052.** Certain flight instruction is required for the issuance of a certificate. If that instruction is in a multiengine airplane, the instructor is required, in part, to have

1—at least 5 hr. of experience as pilot in command in the make and model of aircraft involved.
2—given at least 200 hr. of flight instruction.
3—held a flight instructor certificate during the date of instruction.
4—given at least 3 hr. of instrument training in the airplane involved.

**3053.** The minimum pilot in command time requirement for a flight instructor with multiengine privileges to give instruction to a student for a multiengine rating is

1—15 hr. in multiengine aircraft.
2—10 hr. in the make of aircraft in which the instruction is to be given.
3—15 hr. in the make and model of aircraft in which instruction is to be given.
4—5 hr. in the make and model of aircraft in which instruction is to be given.

**3054.** The holder of an expired flight instructor certificate may exchange that certificate for a new one by

1—passing the appropriate oral test.
2—presenting a satisfactory record of instruction.
3—successfully completing a flight instructor refresher course.
4—passing the appropriate practical test.

**3055.** What is the maximum distance from an airport that an airplane engaged in training operations may be operated without an ELT?

1—10 mi.
2—25 mi.
3—50 mi.
4—75 mi.

**3056.** Which of these operations is prohibited if the aircraft being used has not had a 100-hour inspection or annual inspection within the preceding 100 hr. of time in service.

1—Carrying property for hire.
2—Conducting any commercial operation.
3—Carrying passengers, either for hire or not for hire.
4—Giving flight instruction for hire.

**3057.** Which conditions are favorable for the formation of a surface based temperature inversion?

1—Broad areas of cumulus clouds with smooth, level bases at the same altitude.
2—Clear, cool nights with calm or light wind.
3—Area of unstable air rapidly transferring heat from the surface.
4—Light wind blowing over a body of warm water which is surrounded by cooler land surfaces.

**3058.** What are the standard temperature and pressure values for sea level?

1—15° C and 29.92" Hg.
2—59° C and 1013.2 millibars.
3—59° F and 29.92 millibars.
4—15° C and 1013.2" Hg.

**3059.** What causes wind?

1—Coriolis force.
2—The Earth's rotation.
3—Air mass modification.
4—Pressure differences.

**3060.** Air tends to flow parallel to isobars rather than directly from high-pressure areas to low-pressure areas. What causes this?

1—Surface friction.
2—Gravity.
3—Coriolis force.
4—Pressure gradient force.

**3061.** The general circulation of air associated with a high-pressure area in the Northern Hemisphere is

1—inward, downward, and counterclockwise.
2—outward, downward, and clockwise.
3—outward, upward, and counterclockwise.
4—inward, upward and clockwise.

**3062.** Select the true statement concerning isobars and windflow patterns around high- and low-pressure systems that are shown on a surface analysis.

1—Surface winds flow perpendicular to the isobars.
2—When the isobars are close together, the pressure gradient force is greater and wind velocities are stronger.
3—Isobars connect contour lines of equal temperature.
4—When the isobars are far apart, crests of standing waves may be marked by stationary lenticular clouds.

**3063.** Which statement is true with respect to a high- or low-pressure system?

1—A low-pressure area or trough is an area of descending air.
2—A high-pressure area or ridge is an area of descending air.
3—A high-pressure area or ridge is an area of rising air.
4—A low-pressure area is a ridge of descending air.

**3064.** Which statement is true regarding high- or low-pressure systems?

1—A high-pressure area or ridge is an area of rising air.
2—A low-pressure area or trough is an area of rising air.
3—Both high- and low-pressure areas are characterized by descending air.
4—A high-pressure area is a trough of descending air.

**3065.** The formation of either predominantly stratiform or predominantly cumuliform clouds is dependent upon the

1—temperature of the air being lifted.
2—source of lift.
3—percent of moisture content of the air being lifted.
4—stability of the air being lifted.

**3066.** The conditions necessary for the formation of cumulonimbus clouds are a lifting action and

1—stable, dry air.
2—unstable, dry air.
3—unstable, moist air.
4—stable, moist air.

**3067.** If clouds form as a result of very stable, moist air being forced to ascend a mountain slope, the clouds will be

1—cirrus type with no vertical development or turbulence.
2—cumulonimbus with considerable vertical development and heavy rains.
3—cumulus type with considerable vertical development and turbulence.
4—stratus type with little vertical development and little or no turbulence.

**3068.** A moist, unstable air mass is characterized by

1—cumuliform clouds and showery precipitation.
2—poor visibility and smooth air.
3—stratiform clouds and continuous precipitation.
4—fog and drizzle.

**3069.** When an air mass is stable, which of these conditions are most likely to exist?

1—Smoke, dust, haze, etc., concentrated at the lower levels with resulting poor visibility.
2—Numerous towering cumulus and cumulonimbus clouds.
3—Moderate to severe turbulence at the lower levels.
4—Good visibility at the surface with dust, smoke, and haze at the higher levels.

**3070.** Which of the following is a characteristic of stable air?

1—Showery-type precipitation.
2—Cumuliform clouds.
3—Excellent visibility.
4—Restricted visibility.

**3071.** What type weather can one expect from moist, unstable air and very warm surface temperature?

1—Continuous heavy precipitation.
2—Smooth air, cloudless skies.
3—Fog and low stratus clouds.
4—Strong updrafts and cumulonimbus clouds.

**3072.** Which of the following is a characteristic typical of a stable air mass?

1—Turbulent air.
2—Cumuliform clouds.
3—Continuous precipitation.
4—Showery precipitation.

**3073.** A moist, warm air mass that is being cooled from below is characterized, in part, by

1—smooth air.
2—good visibility.
3—cumuliform clouds.
4—showers and thunderstorms.

**3074.** Consider the following air mass characteristics:

A. Smooth air (above the friction level) and fair to poor visibility.
B. Turbulence up to about 10,000 ft. and good visibility, except in areas of precipitation.
C. Cumuliform clouds.
D. Stratiform clouds.
E. Stable lapse rate.
F. Unstable lapse rate.

A moist air mass which is colder than the surface over which it passes, frequently has which of the above characteristics?

1—A, D, and E.
2—B, D, and E.
3—B, C, and F.
4—A, D, and F.

**3075.** Frontal waves normally form on

1—stationary or occluded fronts.
2—rapidly moving cold fronts or warm fronts.
3—slow moving warm fronts or occluded fronts.
4—slow moving cold fronts or stationary fronts.

**3076.** Name a characteristic of an advancing warm front that has moist, stable air.

1—Turbulent air; cumuliform clouds.
2—Smooth air; stratiform clouds.
3—Fast movement; intermittent precipitation.
4—Fast movement; continuous precipitation.

**3077.** Which of the following types of clouds would indicate areas of convective turbulence?

1—Towering cumulus clouds.
2—Cirrus clouds.
3—Standing lenticular altocumulus clouds.
4—Nimbostratus clouds.

**3078.** When flying low over hilly terrain, ridges, or mountain ranges the greatest potential danger from turbulent air currents will usually be encountered on the

1—windward side when flying with the wind.
2—leeward side when flying with the wind.
3—leeward side when flying into the wind.
4—windward side when flying into the wind.

**3079.** If a strong temperature inversion is encountered immediately after takeoff or during an approach to a landing, a potential hazard exists because of turbulence created by

1—cold air over-riding calm, warm air.
2—strong convective currents.
3—strong surface winds.
4—wind shear.

**3080.** Low-level wind shear, which results in a sudden change of wind direction, may occur

1—after a warm front has passed.
2—when surface winds are light and variable.
3—when surface winds are 15 kts. and there is no change in wind direction and windspeed with height.
4—when there is a low-level temperature inversion with strong winds above the inversion.

**3081.** Low-level wind shear is best described as

1—deflection of wind currents as the result of Coriolis force.
2—a downward motion of the air associated with continuous winds blowing with an easterly component due to the rotation of the Earth.
3—a change in wind direction and/or speed within a very short distance in the atmosphere.
4—a violently rotating column of air extending from a cumulonimbus cloud.

**3082.** Which situation would most likely result in freezing rain?

1—Rain falling from air which has a temperature of 32° F or less into air having a temperature of more than 32° F.
2—Rain falling from air which has a temperature of 0° C or less into air having a temperature of 0° C or more.
3—Rain which has a supercooled temperature of 0° C or less falling into air having a temperature of more than 0° C.
4—Rain falling from air which has a temperature of more than 32° F into air having a temperature of 32° F or less.

**3083.** Select the true statement pertaining to the life cycle of a thunderstorm.

1—The beginning of rain at the Earth's surface indicates the mature stage of the thunderstorm.
2—The beginning of rain at the Earth's surface indicates the dissipating stage of the thunderstorm.
3—Updrafts continue to develop throughout the dissipating stage of a thunderstorm.
4—The initial stage of a thunderstorm is always indicated by the development of a nimbus cloud.

**3084.** The conditions necessary for the formation of cumulonimbus clouds are a lifting action and

1—stable, dry air.
2—unstable, dry air.
3—unstable, moist air.
4—stable, moist air.

**3085.** Which statement is true regarding squall lines?

1—They are always associated with cold fronts.
2—They are always associated with warm fronts.
3—They are slow in forming, but rapid in movement.
4—They are nonfrontal and often contain severe, steady-state thunderstorms.

**3086.** The most severe weather conditions, such as destructive winds, heavy hail, and tornadoes, are generally associated with

1—fast-moving warm fronts.
2—slow-moving cold fronts.
3—slow-moving warm fronts.
4—squall lines and steady-state thunderstorms.

**3087.** Which statement is true concerning the in-flight hazard of hail?

1—Large hailstones are entirely composed of clear ice.
2—Tropical and subtropical thunderstorms contain more hail than thunderstorms in northern latitudes.
3—Hailstones may be thrown outward from a storm cloud for several miles.
4—Hail is usually produced by altocumulus clouds.

**3088.** Hail, an in-flight hazard, is most likely to be associated with

1—cirrocumulus clouds.
2—stratocumulus clouds.
3—cumulonimbus clouds.
4—cumulus clouds.

**3089.** With respect to advection fog, which statement is true?

1—It forms almost exclusively at night or near daybreak.
2—It forms when unstable air is cooled adiabatically.
3—It is slow to develop, and dissipates quite rapidly.
4—It can appear suddenly during day or night, and it is more persistent than radiation fog.

**3090.** One condition necessary for the formation of fog is

1—high relative humidity.
2—calm air.
3—visible moisture.
4—relative low pressure.

**3091.** Radiation fog is most likely to occur with which of the following conditions?

1—Warm, moist air being forced upslope by light winds resulting in the air being cooled and condensed.
2—Low temperature/dew point spread, calm wind conditions, the presence of hydroscopic nuclei, low overcast, and favorable topography.
3—High humidity during the early evening, cool cloudless night with light winds, and favorable topography.
4—Warm, moist air flowing over a cold surface with an 8 to 10 kts. wind causing mixing and condensation.

**3092.** Advection fog is formed as a result of

1—moist air moving over a colder surface.
2—the ground cooling adjacent air to the dew point temperature on clear, calm nights.
3—the addition of moisture to a mass of cold air as it moves over a body of water.
4—moist, unstable air being cooled as it is forced up a sloping land surface.

**3093.** If a high-pressure area stagnates over an industrial area, a pilot can expect

1—gusty surface winds.
2—scattered showers and excellent surface visibility.
3—clear sky with excellent surface and flight visibility.
4—poor surface visibility with little chance of improvement.

**3094.** A thermal column is rising from an asphalt parking lot and the wind is from the south at 12 kts. Which statement would be true?

1—The slowest rate of sink would be close to the thermal and the fastest rate of sink farther from it.
2—As altitude is gained, the center of the thermal will be found farther north of the parking lot.
3—As altitude is gained, the best lift will be found directly above the parking lot.
4—The best lift will be found several thousand feet directly beneath another glider working that thermal.

**3095.** Which statement is true regarding the effect of fronts on soaring conditions?

1—Good soaring conditions usually exist after passage of a warm front.
2—Frequently the air behind a cold front provides excellent soaring for several days.
3—Excellent soaring conditions usually exist in the cold air ahead of a warm front.
4—A slow moving front provides the strongest lift.

**3096.** Convective circulation patterns associated with sea breezes are caused by

1—warm and less dense air moving inland from over the water, causing it to rise.
2—water absorbing and radiating heat faster than the land.
3—land absorbing and radiating heat faster than the water.
4—cool and less dense air moving inland from over the water, causing it to rise.

**3097.** One of the most dangerous features of mountain waves is the turbulent areas in and

1—above lenticular clouds.
2—below lenticular clouds.
3—below roll clouds.
4—above roll clouds.

**3098.** The conditions most favorable to wave formation over mountainous areas are a layer of

1—stable air at mountaintop altitude and a wind of at least 20 MPH blowing across the ridge.
2—unstable air at mountaintop altitude and a wind of at least 20 MPH blowing across the ridge.
3—either stable or unstable air at mountaintop altitude and a wind of at least 30 MPH blowing parallel to the ridge.
4—moist, unstable air at mountaintop altitude and a wind of less than 5 MPH blowing across the ridge.

**3099.** When soaring in the vicinity of mountain ranges, the greatest potential danger from vertical and rotor–type currents will usually be encountered on the

1—windward side when flying with the wind.
2—leeward side when flying with the wind.
3—leeward side when flying into the wind.
4—windward side when flying into the wind.

**3100.** One method for locating thermals is to

1—fly an ever increasing circular path.
2—maintain a straight track downwind.
3—look for converging streamers of dust or smoke.
4—look for diverging streamers of dust or smoke.

**3101.** An important precaution when soaring in a dust devil is to

1—avoid the eye of the vortex because of extreme turbulence.
2—avoid the clear area at the outside edge of the dust because of severe downdrafts.
3—maintain the same direction as the rotation of the vortex for maximum lift.
4—avoid steep turns on the upwind side to prevent being blown into the vortex.

**3102.** One of the best visual indications of a thermal is

1—a fragmented cumulus cloud with a concave base.
2—a smooth cumulus cloud with a concave base.
3—a broken to overcast sky with cumulus clouds.
4—clouds forming at the base of a temperature inversion.

**3103.** The most favorable type thermals for cross–country soaring may be found

1—just ahead of a warm front.
2—along thermal streets.
3—under mountain waves.
4—over altocumulus clouds.

**3104.** Under what condition can enough lift be found for soaring under stable weather conditions?

1—Over steep escarpments or cliffs.
2—In mountain waves that form on the upwind side of the mountains.
3—Over isolated peaks when strong winds are present.
4—On the upwind side of hills or ridges with moderate winds present.

**3105.** Refer to the sounding taken at 0900 GMT from 2,500 ft. to 15,000 ft., as shown on the Pseudo–Adiabatic Chart (see Figure 1). What minimum surface temperature is required for instability to occur and for good thermals to develop from the surface to 15,000 ft. MSL?

1—90° F.
2—58° F.
3—68° F.
4—80° F.

**3106.** Refer to the Pseudo–Adiabatic Chart (Figure 1). At the 0900 GMT sounding and the line plotted from the surface to 10,000 ft., what temperature must exist at the surface for instability to take place between these altitudes?

1—Any temperature less than 68° F.
2—Any temperature more than 68° F.
3—Any temperature less than 43° F.
4—Any temperature between 43° F and 68° F.

**3107.** Refer to the Pseudo–Adiabatic Chart (Figure 1) and the soundings taken at 1400 GMT. Is the atmosphere stable or unstable and at what altitudes?

1—Stable from 10,000 to 13,000 ft.
2—Unstable from 10,000 to 13,000 ft.
3—Stable from 6,000 to 10,000 ft.
4—Neutrally stable from 2,500 to 6,000 ft.

**3108.** Refer to the Pseudo–Adiabatic Chart (Figure 1). Using the 1400 GMT soundings, does an inversion exist, and if so at what altitudes?

1—Yes, between 2,500 and 6,000 ft.
2—No, there is no inversion shown.
3—Yes, between 10,000 and 13,000 ft.
4—Yes, between 13,000 and 15,000 ft.

**3109.** Refer to Figure 2. Which station is reporting the wind as calm?

1—FTW.
2—DAL.
3—DFW.
4—TYR.

**3110.** Refer to Figure 2. In the report for TYR, what does the F2 mean?

1—Tower visibility is reported as 2 mi.
2—Rainfall in the past 24 hr. was 2 in.
3—The runway visual range is 2,000 ft.
4—Two–tenths of the sky is obscured by fog.

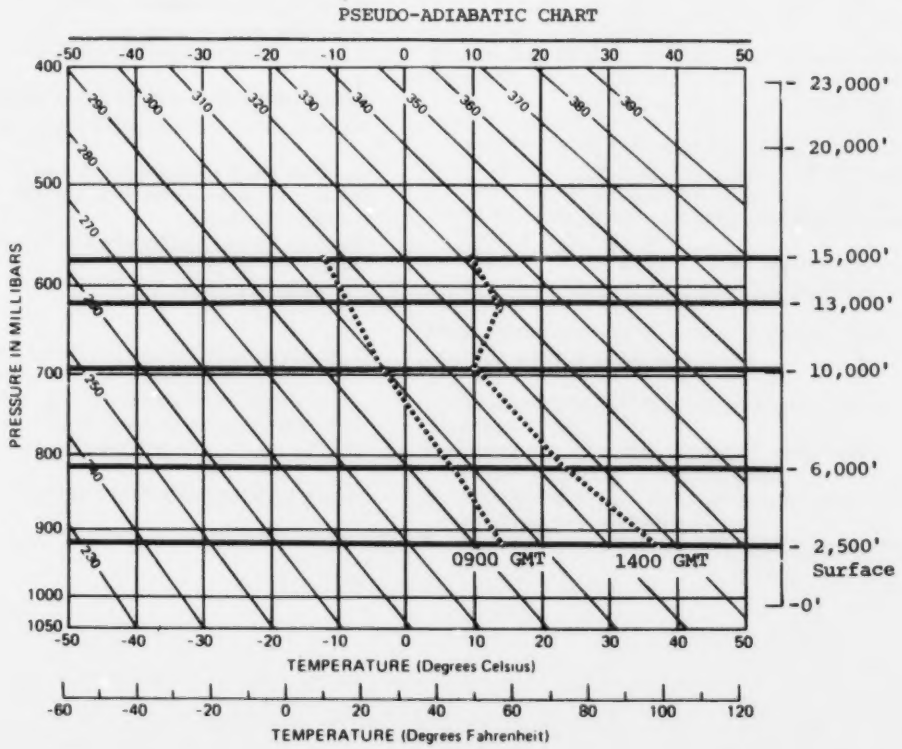


Figure 1

SELECTED SURFACE AVIATION WEATHER REPORTS

```
SA 3Ø17Ø1
FTW SA 1654 -X M6 OVC 11/2HK 69/63/Ø9Ø4/Ø1Ø/ F2 TWR VSBY 21/2 CIG RGD
DFW SA 1646 M8 OVC 4F 193/68/64/11Ø5/Ø111
DAL SA 1649 M9 OVC 4FH 72/63/ØØØØ/Ø1Ø
TYR SA 165Ø -X 15 SCT 3F 76/66/Ø8Ø4/999/F2
ABI SA 1651 3Ø SCT E2ØØ OVC 25 168/74/51/1614/ØØ8 CB W-N
AMA SA 1651 M5 OVC 4F 217/51/48/Ø516/Ø23/LB26E4Ø
AUS RS 1651 M1Ø BKN 24 BKN 16Ø OVC 4R-H 169/7Ø/63/12Ø8/ØØ5/RB25
BRO SA 1655 2Ø SCT 13Ø SCT E25Ø OVC 7 149/85/67/1515G2Ø/997/
RB19E25 TCU ALQDS
```

Figure 2

**3111.** Refer to Figure 2. What is the reported duration of the rain at the time of the observation at AUS?

1—36 min.
2—26 min.
3—25 min.
4—24 min.

**3112.** Refer to Figure 2. What does the LB26E40 mean at the end of the report for AMA?

1—The wind in the vicinity of rain showers was estimated at 26 to 40 kts.
2—Lightning began at 1726.
3—There are large buildups to the east with wind gusting to 40 kts.
4—Drizzle began at 26 past the hour and ended at 40 past the hour.

**3113.** Refer to Figure 2. Which station is reporting the lowest visibility?

1—AUS.
2—TYR.
3—ABI.
4—FTW.

**3114.** Refer to Figure 3. What is the temperature for 6,000 ft. at AMA?

1—The temperature is standard for that altitude.
2—+4° C.
3—+8° C.
4—No temperatures are forecast for levels within 2,500 ft. of station elevation.

**3115.** Refer to Figure 3. Why is there no wind forecast for 3,000 and 6,000 ft. at ABQ?

1—No winds are forecast within 1,500 ft. of station elevation.
2—Winds less than 10 kts. are omitted from the forecast.
3—No winds are forecast within 3,000 ft. of station elevation.
4—Wind which is expected to be light and variable is omitted.

**3116.** Refer to Figure 3. What is the forecast wind for 12,000 ft. at AMA?

1—Calm.
2—090° at 9 kts.
3—090° in excess of 50 kts.
4—Light and variable.

**3117.** Refer to Figure 3. What is the temperature at 30,000 ft. for DAL?

1—+40° C.
2—-40° C.
3—+40° F.
4—-40° F.

**3118.** Refer to Figure 3. What is the forecast wind at 6,000 ft. for ABI?

1—140° at 11 kts.
2—010° at 40 kts.
3—140° at 9 kts.
4—014° at 9 kts.

WIND AND TEMPERATURES ALOFT FORECAST

```
      FDUS1 KWBC 3Ø164Ø
DATA BASED ON 3Ø12ØØZ

VALID 3Ø18ØØZ    FOR USE 17ØØ-21ØØZ. TEMPS NEG ABV 24ØØØ

FT  3ØØØ    6ØØØ    9ØØØ   12ØØØ   18ØØØ   24ØØØ  3ØØØØ  34ØØØ  39ØØØ

ABI       14Ø9+11 1611+Ø6 16Ø9+Ø1 16Ø8-13 1815-25 192440 192550 191960
ABQ               13Ø7+Ø8 16Ø8+Ø1 2ØØ5-13 25Ø8-26 271642 282151 292460
AMA       Ø4Ø8    Ø9Ø5+Ø5 99ØØ+ØØ 21Ø8-13 2214-25 232141 232351 232261
BRO 99ØØ 2211+14 2314+Ø9 2318+Ø4 2428-1Ø 2336-23 234739 235448 246358
DAL 1ØØ8 15Ø6+11 17Ø5+Ø7 2ØØ6+Ø1 221Ø-13 2217-24 22274Ø 223Ø49 232960
ICT 3514 3412+Ø6 321Ø+Ø3 291Ø-Ø1 2618-13 2526-26 253542 254Ø52 254463
```

Figure 3

**3119.** Refer to Figure 4. What is the visibility forecast for BRO?

1—4 mi.
2—1 mi.
3—3 mi.
4—Greater than 6 mi.

**3120.** Refer to Figure 4. What type of weather can be expected after 0400Z at DAL?

1—At least a ceiling of 1,000 ft. and visibility of 3 mi.
2—Ceiling of more than 3,000 ft. and visibility greater than 5 mi.
3—VFR with a slight chance of the visibility being 2 mi. with thundershowers and fog.
4—VFR with wind in excess of 25 kts.

**3121.** Refer to Figure 4. What is the lowest ceiling forecast for AUS?

1—500 ft.
2—1,400 ft.
3—200 ft.
4—2,000 ft.

**3122.** Refer to Figure 4. Which of the stations are forecasting the wind to be less than 10 kts. for the entire forecast period?

1—ABI.
2—ACT.
3—BRO.
4—AUS and ACT.

**3123.** Refer to Figure 4. The valid time for the forecasts is from

1—1000Z on the 30th until 1000Z on the following day.
2—0940Z on the 30th until 0940Z the following day.
3—1000Z on the 30th until 2200Z on the 30th.
4—1010Z on the 30th until 1000Z the following day.

**3124.** To determine the freezing level and areas of probable icing aloft, you should refer to the

1—Radar Summary Chart.
2—Weather Depiction Chart.
3—Area Forecast.
4—Surface Analysis.

**3125.** For a brief summary of the location and movement of fronts, pressure systems, and circulation patterns, the pilot should refer to the

1—Terminal Forecast.
2—Radar Summary Chart.
3—Stability Chart.
4—Area Forecast.

**3126.** What is the meaning of the term MVFR, as used in the categorical outlook portion of terminal and area forecasts?

1—A ceiling of 1,000 to 3,000 ft., and/or visibility of 3 to 5 mi.
2—A ceiling less than 1,000 ft., and/or visibility less than 3 mi.
3—A ceiling of 3,000 to 5,000 ft., and visibility of 5 to 7 mi.
4—A ceiling less than 1,000 ft., and/or visibility less than 1 mi.

**3127.** An area forecast is valid for

1—18 hr. with an additional 12 hr. categorical outlook.
2—12 hr. with an additional 12 hr. categorical outlook.
3—12 hr. with an additional 6 hr. categorical outlook.
4—6 hr. with an additional 6 hr. categorical outlook.

SELECTED TERMINAL FORECASTS

FT 3Ø0940
ABI 3Ø1Ø1Ø C25Ø BKN 1413. 12Z 2Ø SCT C1ØØ BKN 1615 CHC C14 OVC
1TRW. 18Z 3Ø SCT C1ØØ BKN 1716 CHC C1Ø OVC 1TRW. Ø2Z 8Ø SCT C25Ø BKN
Ø4Z VFR..

ACT 3Ø1Ø1Ø C1 X 1/2F VRBL C7 BKN 3F. 17Z C2Ø BKN CHC C12 OVC 2TRW.
Ø4Z VFR CIG ABV 1Ø THSD BCMG IFR CIG TRWF..

AMA 3Ø1Ø1Ø C8 OVC 3R-F Ø314 CHC C5 OVC 1TRW-F. 17Z C18 BKN Ø418
CHC C8 OVC 1TRWF. 2ØZ C3Ø BKN 1417 CHC C1Ø OVC 1TRW+F. Ø4Z MVFR CIG..

AUS 3Ø1Ø1Ø C5 OVC 2F. 14Z C14 OVC 151Ø CHC TRW. 2ØZ C2Ø OVC 151Ø
CHC C5 OVC 2TRW G25. Ø2Z C12 OVC 1Ø1Ø CHC TRW. Ø4Z MVFR CIG TRW..

BRO 3Ø1Ø1Ø 4Ø SCT C15Ø OVC 121Ø. 14Z C3Ø BKN 1512 CHC RW/TRW. Ø2Z
C12 OVC 1Ø1Ø CHC RW/TRW. Ø4Z MVFR CIG TRW..

DAL 3Ø1Ø1Ø 8Ø SCT C25Ø 4F VRBL C4 OVC 1F. 16Z C18 BKN Ø512 SLGT CHC
C12 OVC 2TRWF. 19Z 3Ø SCT C 8Ø BKN Ø612 SCT CHC C1Ø OVC 1TRWF. Ø4Z
VFR..

Figure 4

**3128.** Refer to Figure 5. Which is a true statement?

1—The pilot reported a north wind at 30 kts. at BRO.
2—There are moderate buildups west of ABI.
3—It is clear above 8500 at DAL.
4—The visibility at ABI is 15 mi.

**3129.** Refer to Figure 5. Turbulence was reported west of

1—DAL.
2—ABI.
3—AUS.
4—BRO.

**3130.** Refer to Figure 5. Which is the true statement?

1—Moderate turbulence was reported by a pilot east of ABI.
2—Rime ice was reported west of AUS below 9,000 ft.
3—The base of the overcast at AUS was reported to be 13,000 ft.
4—Thunderstorms were reported north of BRO.

**3131.** Refer to Figure 5. The lowest cloudbase reported is

1—4,500 ft. at DAL.
2—5,000 ft. at BRO.
3—1,300 ft. at AUS.
4—500 ft. at BRO.

PILOT REPORTS

UA /OV DAL Ø9ØØ15 1725 FLØ9Ø /TP BE55
/SK Ø45 OVC Ø85 CLR ABV

UA /OV ABI 27ØØ15 1845 FL12Ø /TP C411
/TB MDT BLO-1ØØ

UA /OV AUS 315Ø2Ø 1715 FL15Ø /TP C5ØØ
/SK OVC 13Ø /IC TRACE RIME DURGC WBND Ø9Ø-13Ø

UA /OV BRO 36ØØ3Ø 17ØØ FLØ45 /TP PA31
/SK Ø5Ø OVC /RM LRG TSTM 5ØN BRO 2Ø WIDE

Figure 5

**3132.** What information would be covered in an AIRMET?

1—Embedded thunderstorms.
2—Hail of 3/4 in. or greater diameter.
3—Severe turbulence.
4—Extensive mountain obscurement.

**3133.** Which in-flight advisory would contain information on severe icing?

1—Convective SIGMET.
2—SIGMET.
3—AIRMET.
4—PIREP.

**3134.** What information is contained in a convective SIGMET in the conterminous U.S.?

1—Tornadoes, embedded thunderstorms, and hail 3/4 in. or greater in diameter.
2—Severe icing, severe turbulence, or widespread dust storms lowering visibility to less than 3 mi.
3—Weather less than basic VFR and sustained winds of 30 kts. or greater at the surface.
4—Ceilings less than 500 ft. and visibility less than 1 mi.

**3135.** Interpret the following radar weather report:

LIT 1133 AREA 4TRW+/+ 22/1ØØ 88/17Ø
196/18Ø
22Ø/115 C2425 MT 31Ø AT 162/11Ø

Which statement is true concerning the report?

1—The maximum top of the cells is located 162° and 110 NM from the station (LIT).
2—There are four cells with tops at 10,000 ft., 17,000 ft., and 11,500 ft.
3—The cells are moving in a direction of 162° at 10 kts.
4—The visibility is 4 mi. in thunderstorms and the intensity of thunderstorms remains unchanged.

**3136.** Which statement is true concerning this radar weather report for OKC?

OKC 1934 LN 8TRW++/+ 86/4Ø 164/6Ø
199/115
15W 2425 MT 57Ø AT 159/65 2 INCH HAIL
RPRTD THIS ECHO.

1—The visibility is 8 mi. in rain showers.
2—The line of cells is moving 080° with winds reported up to 40 kts.
3—There are three cells with tops at 11,500, 40,000, and 60,000 ft.
4—The maximum top of the cells is 57,000 ft. located 65 NM south-southeast of the station.

**3137.** Radar weather reports are of special interest to pilots because they report

1—large areas of low ceilings and fog.
2—location of precipitation along with type, intensity, and trend.
3—location of broken to overcast clouds.
4—icing conditions.

**3138.** By referring to the isobars on a Surface Analysis (weather map), what can a person determine?

1—Areas of magnetic variation.
2—Areas of precipitation.
3—Pressure gradient.
4—Temperature changes.

**3139.** The intensity trend of a front (as of map time) is best determined by referring to a

1—Radar Summary Chart.
2—Surface Analysis.
3—Constant Pressure Chart.
4—Weather Depiction Chart.

**3140.** On a Weather Depiction Chart, what weather conditions would be contained in an unshaded area that is enclosed by a smooth line?

1—Ceiling greater than 3,000 ft. and/or visibility greater than 5 mi.
2—Ceiling between 5,000 and 7,000 ft. and/or visibility greater than 5 mi.
3—Ceiling less than 1,000 ft. and/or visibility less than 3 mi.
4—Ceiling between 1,000 and 3,000 ft. and/or visibility between 3 and 5 mi.

**3141.** A Weather Depiction Chart is useful to a pilot in determining

1—areas of equal barometric pressure.
2—the temperature and dew point at selected stations.
3—the forecast areas of cloud cover and precipitation.
4—areas where weather conditions were reported above or below VFR minimums.

**3142.** The Weather Depiction Chart in Figure 6 indicates that the coastal sections of Texas and Louisiana are reporting

1—ceilings of 250 feet with patchy ground fog.
2—all ceilings at or above 20,000 feet with visibilities of 20 miles or more.
3—marginal VFR conditions due to broken ceilings of 2,000 feet.
4—VFR conditions with scattered clouds at 2,000 feet and higher cirroform.

**3143.** The Weather Depiction Chart in Figure 6 indicates the heaviest precipitation along the front is occurring in

1—Oklahoma.
2—Missouri.
3—Illinois.
4—Kansas.

**3144.** The Weather Depiction Chart in Figure 6 indicates that northern Illinois and southern Wisconsin are reporting

1—marginal VFR conditions due to reduced visibility in drizzle and fog.
2—low IFR conditions due to ceilings below 500 feet with drizzle.
3—IFR conditions due to overcast ceilings less than 1,000 feet with reduced visibilities in rain and rain showers.
4—VFR ceilings but reduced visibilities due to fog and haze.

**3145.** The Weather Depiction Chart in Figure 6 indicates that most of Virginia is reporting

1—marginal VFR conditions due to extensive low ceilings.
2—marginal VFR conditions due to reduced visibilities in fog and haze.
3—IFR conditions due to very low visibilities and frontal buildups.
4—continuous rain and rain showers due to warm air advection.

**3146.** What restrictions to visibility, if any, are depicted in western Iowa? (See Figure 6.)

1—Fog and haze.
2—Fog, rain, and haze.
3—Drizzle, fog, and rain.
4—Drizzle.

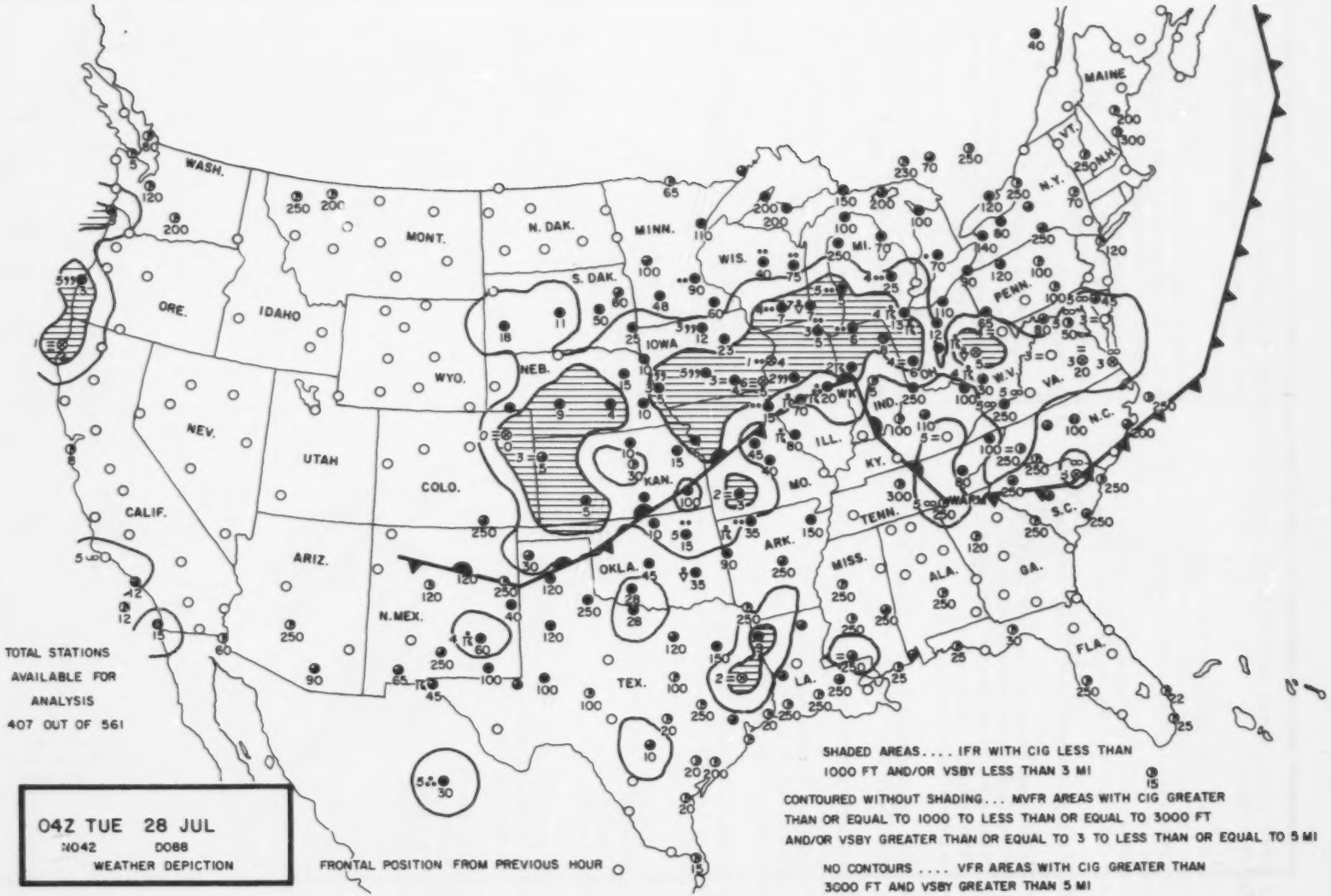
WASH.
ORE.
CALIF.
IDAHO
NEV.
MONT.
WYO.
UTAH
ARIZ.
COLO.
N.MEX.
N. DAK.
S. DAK.
NEB.
KAN.
OKLA.
TEX.
MINN.
IOWA
MO.
ARK.
LA.
WIS.
ILL.
MISS.
MICH.
IND.
KY.
TENN.
ALA.
GA.
FLA.
S.C.
N.C.
VA.
W.V.
OHIO
PENN.
N.Y.
MAINE
VT.
N.H.
TOTAL STATIONS
AVAILABLE FOR
ANALYSIS
407 OUT OF 561
04Z TUE 28 JUL
N042 D088
WEATHER DEPICTION
FRONTAL POSITION FROM PREVIOUS HOUR
SHADED AREAS.... IFR WITH CIG LESS THAN
1000 FT AND/OR VSBY LESS THAN 3 MI
CONTOURED WITHOUT SHADING... MVFR AREAS WITH CIG GREATER
THAN OR EQUAL TO 1000 TO LESS THAN OR EQUAL TO 3000 FT
AND/OR VSBY GREATER THAN OR EQUAL TO 3 TO LESS THAN OR EQUAL TO 5 MI
NO CONTOURS .... VFR AREAS WITH CIG GREATER THAN
3000 FT AND VSBY GREATER THAN 5 MI

Figure 6

**3147.** Which area(s) should have the lowest ceilings at 1800Z? (See Figure 7.)

1—The area just ahead of the cold front.
2—About 150 miles ahead and along the cold front.
3—The area extending from northern Kansas to western Wisconsin.
4—The areas where precipitation is expected to occur — east of the cold front and west of the warm front.

**3148.** Where is snow expected at 1800Z? (See Figure 7.)

1—From northwest Kansas to the Great Lakes and from northwest Colorado northward to Canada.
2—Immediately behind and ahead of the cold front.
3—Northern Oregon and Washington.
4—In the central Great Lakes area.

**3149.** What type precipitation is expected in eastern Arkansas at 1800Z? (See Figure 7.)

1—Rain showers and thunderstorms affecting .5 or more of the area.
2—Rain showers over the entire area.
3—Continuous rain in .5 or more of the area.
4—Continuous rain over the entire area.

**3150.** At what altitude is the freezing level in central Oklahoma as forecast on the 24-hour significant weather prog? (See Figure 7.)

1—4,000 feet MSL.
2—5,000 feet MSL.
3—6,000 feet MSL.
4—8,000 feet MSL.

**3151.** At what altitude is the freezing level in central Oklahoma as forecast on the 12-hour significant weather prog? (See Figure 7.)

1—On the surface.
2—800 feet AGL.
3—4,000 feet MSL.
4—8,000 feet MSL.

**3152.** A Radar Summary Chart helps a pilot in planning a safe flight because it graphically displays a collection of radar reports concerning

1—fog and other obscurations.
2—the intensity and movement of precipitation.
3—clouds and in-flight visibilities.
4—clouds and ceiling heights.

**3153.** What information is provided by the Radar Summary Chart?

1—Areas of clear weather.
2—Lines, cells, and areas of hazardous thunderstorms.
3—Ceilings and precipitation between reporting stations.
4—Areas of cloud cover and fog.

**3154.** From which of the following can the observed temperature, wind, and temperature/dew point spread be determined at specified flight levels?

1—Winds Aloft Forecasts.
2—Significant Weather Prognostic Charts.
3—Constant Pressure Charts.
4—Stability Charts.

**3155.** When using a Constant Pressure Chart for planning a flight at 10,000 ft. MSL, to which of the following should the pilot refer?

1—850-millibar chart.
2—700-millibar chart.
3—500-millibar chart.
4—200-millibar chart.

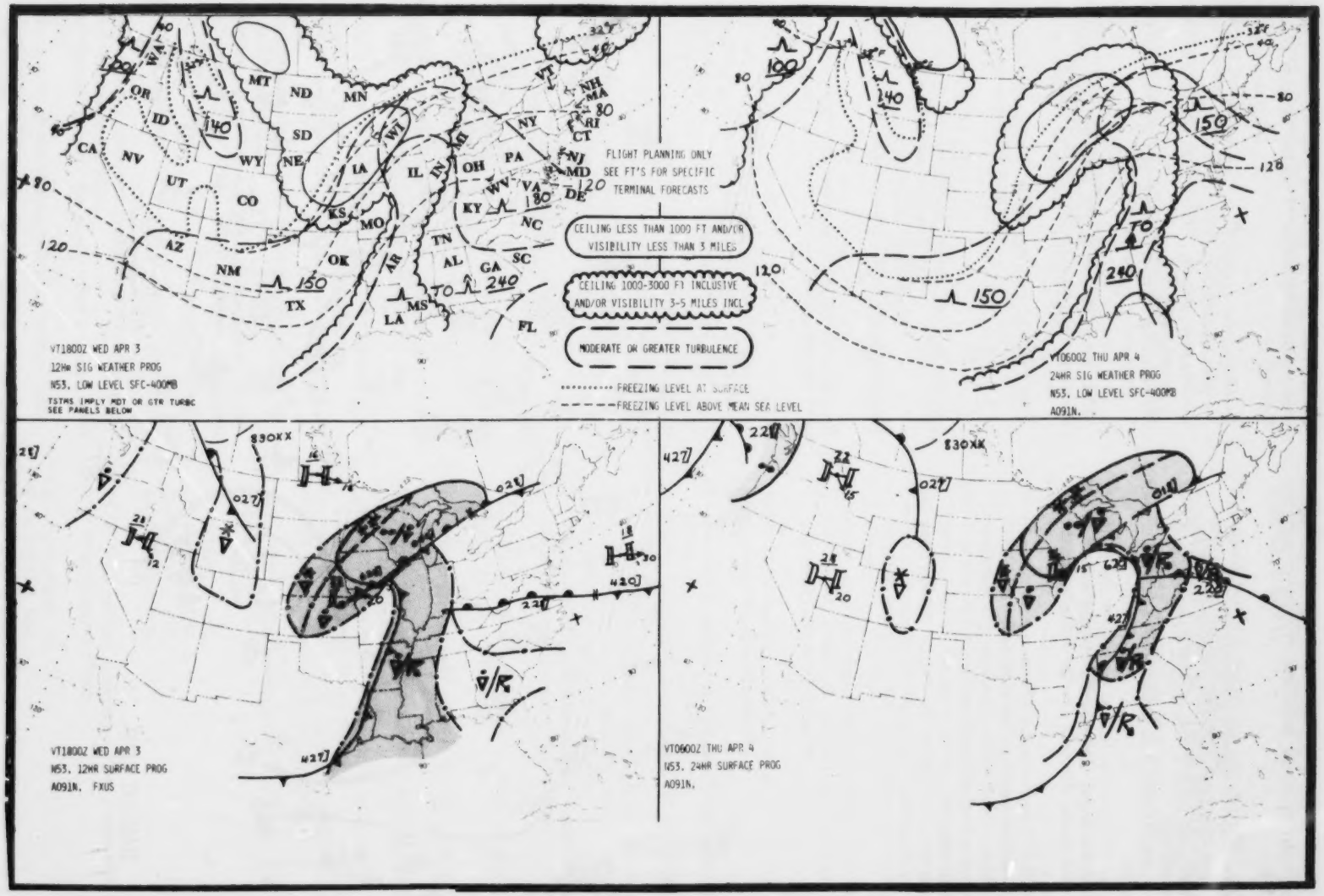
VT1800Z WED APR 3
12Hr SIG WEATHER PROG
N53. LOW LEVEL SFC-400MB
TSTMS IMPLY MDT OR GTR TURBC
SEE PANELS BELOW
FLIGHT PLANNING ONLY
SEE FT'S FOR SPECIFIC
TERMINAL FORECASTS
CEILING LESS THAN 1000 FT AND/OR
VISIBILITY LESS THAN 3 MILES
CEILING 1000-3000 FT INCLUSIVE
AND/OR VISIBILITY 3-5 MILES INCL
MODERATE OR GREATER TURBULENCE
FREEZING LEVEL AT SURFACE
FREEZING LEVEL ABOVE MEAN SEA LEVEL
VT0600Z THU APR 4
24HR SIG WEATHER PROG
N53. LOW LEVEL SFC-400MB
A091N.
VT1800Z WED APR 3
N53. 12HR SURFACE PROG
A091N. FXUS
VT0600Z THU APR 4
N53. 24HR SURFACE PROG
A091N.

Figure 7

**3156.** What are the probable weather conditions in the area indicated by Arrow B on the Stability Chart? (See Figure 8.)

1—Neutral stability; showery precipitation.
2—Low humidity; high scattered cumuliform clouds.
3—Stable air; stratified cloudiness and steady precipitation.
4—Moderate humidity and unstable air; scattered shower activity.

**3157.** What are the probable weather conditions in the area indicated by Arrow C on the Stability Chart? (See Figure 8.)

1—Low relative humidity; limited cumulus activity.
2—Unstable air; instability showers and thunderstorms.
3—Neutral stability; stratus clouds and light precipitation.
4—Moderately saturated air; steady precipitation and light turbulence.

**3158.** What are the probable weather conditions in the area indicated by Arrow D on the Stability Chart? (See Figure 8.)

1—Marginally unstable air; moderate turbulence and possible thunderstorms.
2—Negative stability; cumuliform clouds and scattered shower activity.
3—High relative humidity; showers and thunderstorms.
4—Stable air; predominately fair.

**3159.** Which symbol on the Stability Chart signifies very stable air and no precipitation? (See Figure 8.)

1— $\frac{23}{-15}$

2— $\frac{-3}{34}$

3— $\frac{-5}{17}$

4— $\frac{0}{35}$

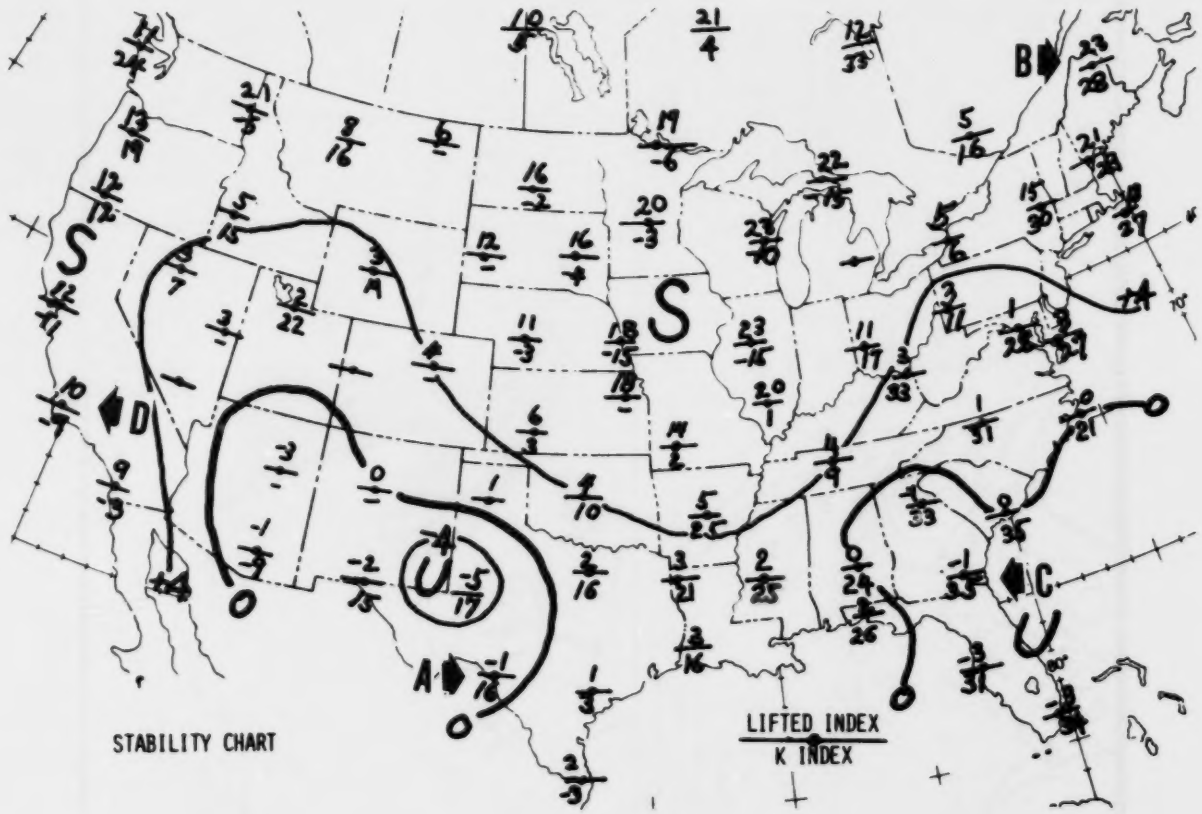


Figure 8

**3160.** Where are warning areas established?

1—In mountainous areas.
2—Beyond the Nation's 3-mi. limit.
3—Surrounding large metropolitan cities.
4—In the vicinity of military bases.

**3161.** Airspace established as warning areas are located

1—in international airspace.
2—in the immediate vicinity of military bases.
3—where hazardous terrain exists.
4—along military low-altitude training routes.

**3162.** Flight through a restricted area should not be accomplished unless the pilot has

1—filed a VFR flight plan.
2—received prior permission from the commanding officer of the nearest military base.
3—an airplane that is transponder equipped.
4—received prior authorization from the controlling agency.

**3163.** Under what condition may an aircraft operate from a satellite airport within an Airport Radar Service Area (ARSA)?

1—The pilot must file a flight plan prior to departure.
2—The pilot must monitor ATC until clear of the ARSA.
3—The pilot must contact ATC as soon as practicable after takeoff.
4—The pilot must secure prior approval from ATC before takeoff at the airport.

**3164.** All operations within an Airport Radar Service Area (ARSA) must

1—be conducted under instrument flight rules.
2—be in compliance with ATC clearances and instructions.
3—be in an aircraft equipped with a 4096 transponder with mode C capability.
4—file a flight plan prior to arrival or departure.

**3165.** MOA consist of airspace of defined vertical and lateral limits and are established for the purpose of

1—military services conducting VFR low-altitude navigation, tactical training, and flight testing.
2—separating certain military training activities from IFR traffic.
3—providing separation of VFR and IFR civil aircraft from military aircraft.
4—denoting the existence of unusual hazards to aircraft, such as artillery firing, aerial gunnery, or guided missiles.

**3166.** When operating VFR in a MOA, a pilot

1—must obtain a clearance from the controlling agency prior to entering the MOA.
2—may operate only on the airways that transverse the MOA.
3—should exercise extreme caution when military activity is being conducted.
4—must operate only when military activity is not being conducted.

**3167.** The purpose of designating certain airspace as a transition area is to

1—ensure that IFR flights can remain within controlled airspace for terminal operations.
2—enable ATC to control all flights within a given area.
3—separate a control zone from a control area.
4—extend the lateral limits of a control zone.

**3168.** When designated in conjunction with an airport which has a published instrument approach procedure, what airspace is defined as a transition area?

1—That airspace extending upward from 700 ft. or more AGL and terminating at the base of the overlying controlled airspace.
2—That airspace extending upward from the surface and terminating at the base of the overlying continental control area.
3—The airspace extending upward from the surface to 3,000 ft. within a 5 SM radius from the center of an airport.
4—Areas that are designated as Group I or Group II TCA's for which all aircraft are subject to the operating rules of FAR Part 91.

**3169.** Radar service available under the terminal radar program for VFR aircraft provides

1—separation between all VFR and IFR aircraft within the TRSA.
2—traffic information and positive control of all aircraft within the TCA.
3—traffic information and headings to fly to join the traffic pattern or to a position behind the preceding aircraft in the approach sequence.
4—traffic information and limited vectoring to VFR aircraft on a workload-permitting basis.

**3170.** Stage III service within a TRSA utilizes radar to provide

1—separation between all VFR aircraft operating within the TRSA.
2—radar vectoring if the weather minimums are below VFR conditions.
3—separation between IFR aircraft, because VFR aircraft are not permitted in the area.
4—separation between all participating VFR aircraft and IFR aircraft operating within the TRSA.

**3171.** Within the conterminous U.S., the floor of the positive control area is

1—10,000 ft. MSL.
2—14,500 ft. MSL.
3—18,000 ft. MSL.
4—24,000 ft. MSL.

**3172.** With certain exceptions, the continental control area extends upward from

1—the surface.
2—10,000 ft. MSL.
3—14,500 ft. MSL.
4—18,000 ft. MSL.

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**3173.** Airport traffic areas normally extend from the surface up to but not including

1—3,000 ft. above the surface surrounding the airport and have the same horizontal limits of the associated control zone.
2—3,000 ft. above the airport and have a radius of 5 SM.
3—the base of the continental control area and have a radius of 10 SM.
4—the upper limit of the associated control zones and have a radius of 5 SM with extensions as necessary for instrument approaches.

**3174.** An airport traffic area extends upward to, but does not include,

1—2,000 ft. MSL.
2—2,000 ft. AGL.
3—3,000 ft. MSL.
4—3,000 ft. AGL.

**3175.** Airport traffic areas are in effect at all airports where

1—the airport is located within the lateral limits of controlled airspace.
2—a control tower is in operation.
3—an FSS is in operation.
4—a control zone is in effect.

**3176.** Control areas within the contiguous U.S. extend upward from either 700 ft. or 1,200 ft. above the surface to but not including

1—3,000 ft. MSL.
2—18,000 ft. MSL.
3—24,000 ft. MSL.
4—the base of the continental control area.

**3177.** Within the contiguous U.S., the vertical limit of control zones extends from the surface upward to

1—but not including 3,000 ft. AGL.
2—but not including 10,000 ft. MSL.
3—the base of the continental control area.
4—infinity.

**3178.** One of the major differences between control zones and control areas is that all control zones

1—begin at the surface, while all control areas begin at an altitude of 700 ft. or higher above the surface.
2—always begin at 700 ft. AGL while control areas always begin at 1,200 ft. above the surface.
3—are located around tower-controlled airports only.
4—have higher basic VFR weather minimums than control areas.

**3179.** Unless otherwise specified, Federal airways extend from

1—the surface upward to 18,000 ft. MSL and are 4 NM wide.
2—1,200 ft. above the surface upward to 14,500 ft. MSL and are 16 NM wide.
3—700 ft. above the surface upward to the continental control area and are 10 NM wide.
4—1,200 ft. above the surface upward to 18,000 ft. MSL and are 8 NM wide.

**3180.** Airport advisory areas exist only at airports with

1—operating control towers.
2—operating FSS's.
3—radar approach and departure service.
4—automatic terminal information service.

**3181.** What is an airport advisory area?

1—That airspace within 5 SM of an airport extending up to, but not including 3,000 ft., within which a control tower is in operation.
2—That airspace within 10 SM of an airport which does not have a control tower but where an FSS is located.
3—That airspace identified by an area on the surface within which flight of an aircraft is subject to special restrictions.
4—The airspace which extends upward from the surface and terminates at the base of the continental control area.

**3182.** When planning a distance flight, true course measurements on a Sectional Aeronautical Chart should be made at a meridian near the midpoint of the course because the

1—angles formed by lines of longitude and the course line vary from point to point.
2—angles formed by isogonic lines and lines of latitude vary from point to point.
3—values of isogonic lines change from point to point.
4—geographic North Pole from which direction is measured is not located at the magnetic North Pole.

**3183.** Which situation would result in reverse sensing of a VOR receiver?

1—Failing to change the OBS from the selected inbound course to the outbound course after passing the station.
2—Flying a heading that is reciprocal to the bearing selected on the OBS.
3—Setting the OBS to a bearing that is 90° from the bearing on which the aircraft is located.
4—Flying a heading that is 90° to the selected bearing on the OBS.

**3184.** In most VOR receivers, the course deviation indicator is so calibrated that a full-scale deflection is registered when the aircraft's position is on a bearing that is

1—1° from the selected course when near the station and 10° from the selected course at a more distant location.
2—10 NM or more to the left or right of the selected course.
3—5° — 7° from the selected bearing.
4—10° — 12° from the selected bearing.

**3185.** Which statement is true regarding tracking on a desired bearing when using ADF during crosswind conditions?

1—When on the desired track inbound with the proper drift correction established, the ADF pointer will be deflected to the windward side of the nose position.
2—When on the desired track outbound with the proper drift correction established, the ADF pointer will be deflected to the windward side of the tail position.
3—To track either inbound or outbound, heading corrections should be made away from the ADF pointer.
4—To track outbound, heading corrections should be made away from the ADF pointer.

**3186.** When diverting to an alternate airport because of an emergency, pilots should

1—complete all plotting, measuring, and computations involved before diverting.
2—climb to a higher altitude because it will be easier to identify checkpoints.
3—apply rule-of-thumb computations, estimates, and other appropriate shortcuts to divert to the new course as soon as possible.
4—rely upon radio as the primary method of navigation.

**3187.** Refer to Figure 9. Which airspace would require ATC authorization prior to entering for a flight from Marion Co. Airport to Columbus Metro Airport?

1—Benning MOA, Restricted Area 3002, TRSA, and the Columbus Airport Traffic Area.
2—Benning MOA, Restricted Area 3002, and Columbus Airport Traffic Area.
3—Restricted area 3002 and Columbus Airport Traffic Area.
4—Restricted Area 3002, TRSA, and Columbus Airport Traffic Area.

**3188.** Refer to Figure 9. What minimum visibility is required to operate a reciprocating engine aircraft in the traffic pattern at Roosevelt Airport under visual flight rules?

1—1 SM.
2—2 SM.
3—3 SM.
4—5 SM.

**3189.** Refer to Figure 9. If the weather is VFR where does the floor of controlled airspace begin 6 statute miles NNW of Columbus Metro Airport?

1—Surface.
2—700 ft. MSL.
3—1,200 ft. MSL.
4—700 ft. AGL.

**3190.** Refer to Figure 9. Where does controlled airspace begin over Roosevelt Airport?

1—Surface.
2—2,080 ft. MSL.
3—1,580 ft. MSL.
4—1,200 ft. MSL.

**3191.** Refer to Figure 9. Where does the floor of controlled airspace begin 10 statute miles NW of Columbus Metro Airport if the weather is IFR?

1—Surface.
2—700 ft. MSL.
3—1,200 ft. MSL.
4—2,000 ft. AGL.

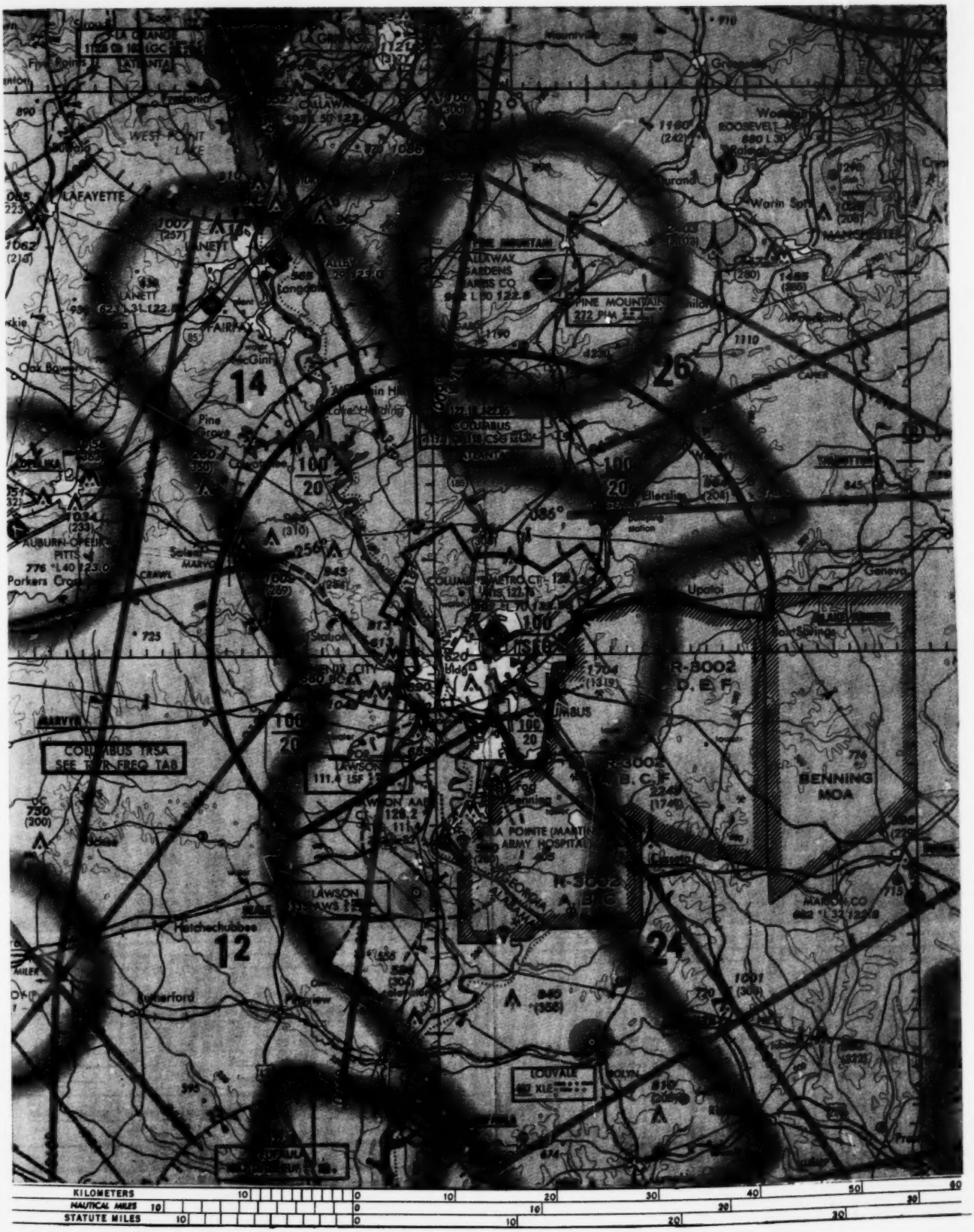

COLUMBUS TRSA
SEE TWR FREQ TAB
BENNING MOA
R-3002 D, E, F
R-3002 B, C, F
14
26
12
24
KILOMETERS
NAUTICAL MILES
STATUTE MILES

Figure 9

**3192.** Refer to Figure 10. What altitude would avoid operating in the TCA on a flight which departs Saginaw Airport and lands at Lakeview Airport?

1—9,500 ft. MSL.
2—3,500 ft. MSL.
3—3,000 ft. MSL.
4—2,500 ft. MSL.

**3193.** Refer to Figure 10. At what altitude does the ceiling of the TRSA terminate over Dallas North Airport?

1—8,000 ft. MSL.
2—5,000 ft. MSL.
3—4,000 ft. MSL.
4—3,000 ft. AGL.

**3194.** Refer to Figure 10. When, if ever, are two-way radio communications required if en route from Lancaster Airport direct to Dallas North Airport at 3,000 ft. MSL?

1—Never.
2—When entering TRSA.
3—When transitioning through Dallas Love and Addison Airport Traffic Areas.
4—When entering the TCA.

**3195.** Refer to Figure 10. Which would be a requirement for a student pilot planning a trip from Meacham Airport to Dallas Love Airport?

1—An altitude which avoids the TCA must be used.
2—A route of flight must be chosen which will avoid operating over the primary airport in the TCA.
3—The aircraft must have a VOR, transponder, and be capable of maintaining two-way radio communications when operating in the TCA.
4—A logbook endorsement by an authorized instructor stating the student has met the requirements of FAR Part 91 to operate solo in a TCA.

TERMINAL CONTROL AREA ALTITUDES
80 – – – Ceiling of TCA in hundreds of feet MSL
50 – – – Floor of TCA in hundreds of feet MSL
FOR FLIGHTS AT AND BELOW 8000 MSL SEE DALLAS-FT WORTH VFR TERMINAL AREA CHART GROUP I TCA
TERMINAL RADAR SERVICE AREA ALTITUDE
DALLAS TRSA
SEE TWR FREQ TAB
FREEDOM FIELD
Valley View
Pilot Point
Van Alstyne
Celina
Frisco
Allen
Lebanon
Argyle
Justin
Haslet
Newark
Keller
Grapevine
Addison
Carrollton
Garland
Dallas
Fort Worth
Arlington
Grand Prairie
Mansfield
Crowley
Burleson
Lancaster
Denton
McKinney
Weston
Anna
Sanger
Greenwood
Slidell
Sycamore
Luck
KILOMETERS
NAUTICAL MILES
STATUTE MILES

Figure 10

**3196.** Refer to Figures 11 and 12. A student plans a flight from Mueller Airport (AUS) direct to Waco Madison Cooper Airport (ACT). As an instructor, what comment would you make regarding the student's selection of 4,500 ft. MSL as a cruising altitude?

1—The altitude is not appropriate to the direction of flight.
2—Obstacle clearance requirements would be violated.
3—The altitude is not appropriate to the direction of flight and a higher altitude should be chosen to assure adequate obstacle clearance.
4—A lower altitude could have been chosen in order to take advantage of more favorable wind.

**3197.** Refer to Figures 11 and 12. A student plans a flight from Draughon Miller Airport (TPL) direct to Easterwood Airport (CLL). As an instructor, what comment would you make regarding the students selection of 5,500 ft. MSL as a cruising altitude?

1—The altitude is not appropriate for the direction of flight.
2—The wind would be more favorable at a lower altitude.
3—Cloud clearance requirements would be violated.
4—Obstacle clearance requirements would be violated.

**3198.** Refer to Figures 11 and 12. Which altitude would satisfy VFR cruising altitudes and distance from cloud requirements for a flight from Killeen Airport (ILE) to Mueller Airport (AUS)?

1—5,500 ft. MSL.
2—4,500 ft. MSL.
3—4,000 ft. MSL.
4—3,500 ft. MSL.

**3199.** Refer to Figure 12. En route from Austin to Waco your student notes no DME information is being received when navigating to TPL VOR. What would cause this?

1—The distant information portion of the VOR is out of service and the student should have checked the NOTAMS.
2—The aircraft altitude may be too low to receive a proper signal.
3—VOR's do not give range information.
4—This could be caused by an altitude which is too low, VOR undergoing maintenance, or a malfunction in the aircraft radio equipment.

**3200.** Refer to Figures 11 and 12. At Killeen Airport (ILE) the base of the ceiling is

1—4,500 ft. MSL.
2—5,345 ft. MSL.
3—7,200 ft. MSL.
4—5,345 ft. AGL.

**3201.** Refer to Figures 11 and 12. At Waco Madison Cooper Airport (ACT) the base of the ceiling is

1—3,000 ft. AGL.
2—3,516 ft. MSL.
3—5,000 ft. MSL.
4—5,516 ft. MSL.

**3202.** Refer to Figure 12. What does the following symbol represent on the World Aeronautical Chart?



1—Military training routes.
2—Power transmission lines.
3—Railroad tracks.
4—Underground pipeline.

SELECTED SURFACE AVIATION WEATHER REPORTS

```
ACT SA 1455 3Ø SCT M5Ø BKN 8 219/72/63/13Ø5/Ø14
AUS SA 1452 M5Ø OVC 15 169/75/63/12Ø8/ØØ5
CLL SA 1453 35 SCT M6Ø BKN 2Ø 149/7Ø/58/1515/997
ILE SA 1454 M45 OVC 1Ø 193/69/62/141Ø/Ø11
TPL SA 1455 M45 BKN 12 192/7Ø/6Ø/15Ø8/Ø1Ø
```

SELECTED WIND AND TEMPERATURES ALOFT FORECAST

| FT | 3ØØØ | 6ØØØ | 9ØØØ | 12ØØØ |
|---|---|---|---|---|
| ACT | 181Ø | 1915 + 18 | 212Ø + 16 | 1915 + 12 |
| AUS | 1616 | 1815 + 2Ø | 1718 + 16 | 172Ø + 1Ø |
| CLL | 13Ø8 | 1112 + 19 | 121Ø + 15 | 1315 + Ø8 |

Figure 11

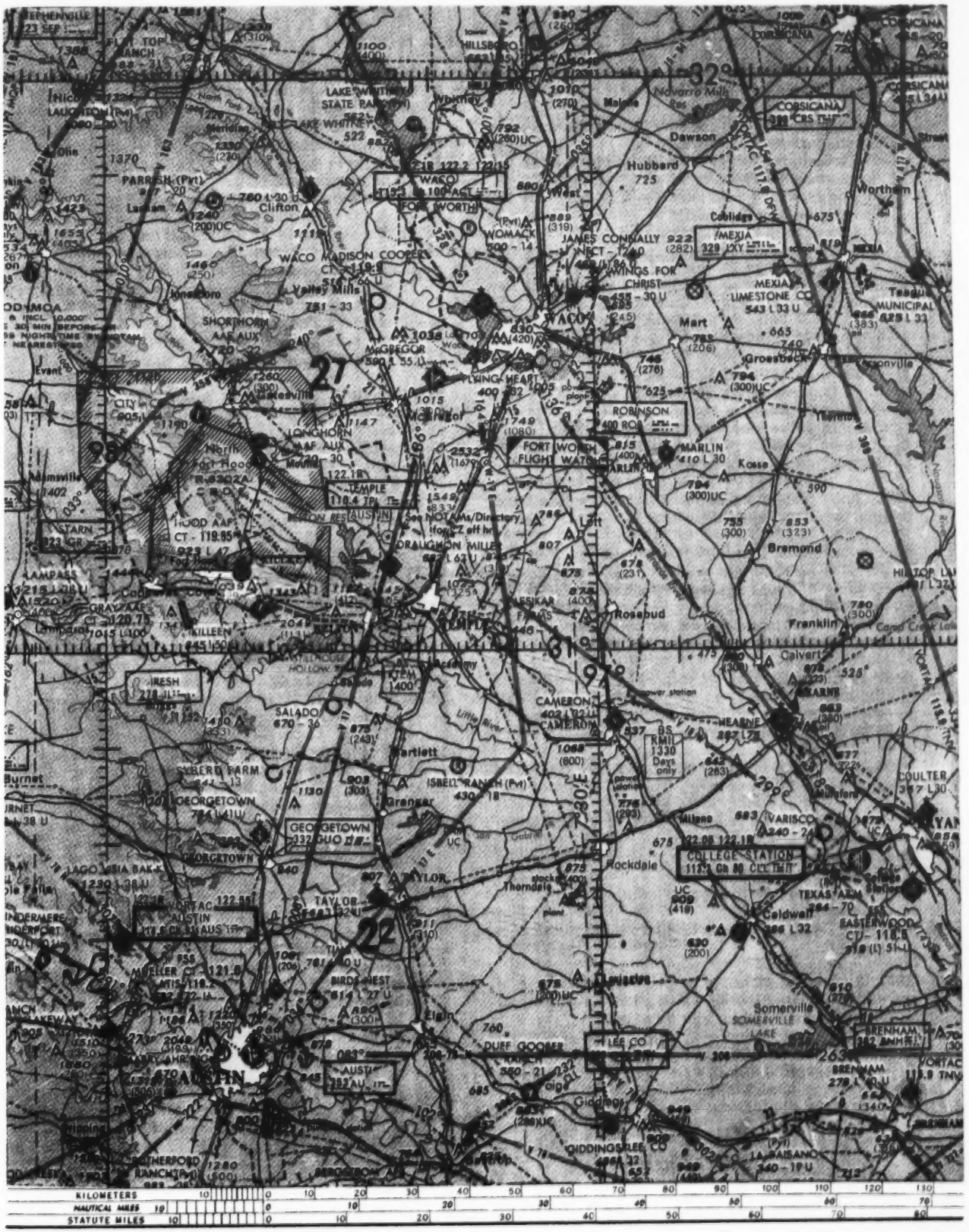

WACO
FORT WORTH
JAMES CONNALLY
MEXIA
CORSICANA
MARLIN
ROBINSON
TEMPLE
AUSTIN
GEORGETOWN
COLLEGE STATION
LEE CO
KILOMETERS
NAUTICAL MILES
STATUTE MILES

Figure 12

**3203.** As it applies to airfoils, which statement is in agreement with Bernoulli's Principle?

1—The speed of a fluid increases at points where the pressure of the fluid increases.
2—The pressure of a fluid decreases at points where the speed of the fluid increases.
3—The pressure of a fluid increases at points where the speed of the fluid increases.
4—The pressure of a fluid decreases at points where the speed of the fluid decreases.

**3204.** An airplane wing is designed to produce lift resulting from relatively

1—positive air pressure below and above the wing's surface.
2—negative air pressure below the wing's surface and positive air pressure above the wing's surface.
3—positive air pressure below the wing's surface and negative air pressure above the wing's surface.
4—negative air pressure below and above the wing's surface.

**3205.** An increase in the speed at which an airfoil passes through the air increases lift because

1—the increased speed of the air passing over the airfoil's upper surface decreases the pressure, thus creating a greater pressure differential between the upper and lower surfaces.
2—the increased speed of the airflow creates a lesser pressure differential between the upper and lower airfoil surfaces.
3—the increased velocity of the relative wind increases the angle of attack.
4—the impact pressure of the air on the lower surface of the airfoil creates less positive pressure.

**3206.** That portion of the aircraft's total drag created by the production of lift is called

1—induced drag, and is greatly affected by changes in airspeed.
2—parasite drag, and is greatly affected by changes in airspeed.
3—induced drag, and is not affected by changes in airspeed.
4—profile drag, and is not affected by changes in airspeed.

**3207.** As airspeed increases in level flight, total drag of the aircraft becomes greater than the total drag produced at the maximum L/D speed because of the

1—increase in induced drag.
2—increase in parasite drag.
3—decrease in parasite drag.
4—decrease in induced drag.

**3208.** As airspeed decreases in level flight, total drag of the aircraft becomes greater than the total drag produced at the maximum L/D speed because of the

1—increase in induced drag.
2—increase in parasite drag.
3—decrease in induced drag.
4—decrease in parasite drag.

**3209.** Which statement describes the relationship of the forces acting on an aircraft in a constant-power and constant-airspeed descent?

1—Thrust is equal to drag; weight is greater than lift.
2—Thrust is equal to drag; lift is equal to weight.
3—Thrust is greater than drag; weight is greater than lift.
4—Thrust is greater than drag; lift is equal to weight.

**3210.** Which statement is true regarding the forces acting on an aircraft in a steady-state climb?

1—The sum of all forward forces is less than the sum of all rearward forces.
2—The sum of all forward forces is greater than the sum of all rearward forces.
3—The sum of all upward forces is greater than the sum of all downward forces.
4—The sum of all upward forces is equal to the sum of all downward forces.

**3211.** As the angle of bank is increased, the vertical component of lift

1—decreases and the sink rate increases.
2—increases and the sink rate decreases.
3—decreases and the sink rate decreases.
4—increases and the sink rate increases.

**3212.** What force causes the aircraft to turn in flight?

1—Horizontal component of lift.
2—Vertical component of lift.
3—Positive yawing movement of the rudder.
4—Increased lift on the lowered wing and decreased lift on the raised wing.

**3213.** Changes in the center of pressure of a wing affect the aircraft's

1—aerodynamic balance and controllability.
2—center-of-gravity location.
3—lifting capacity.
4—lift/drag ratio.

**3214.** Adverse yaw during a turn entry is caused by

1—increased parasite drag on the raised wing and decreased parasite drag on the lowered wing.
2—the same rate of motion between the raised wing and lowered wing.
3—increased induced drag on the lowered wing and decreased induced drag on the raised wing.
4—decreased induced drag on the lowered wing and increased induced drag on the raised wing.

**3215.** When rolling out of a steep-banked turn, what causes the lowered aileron to create more drag than when rolling into the turn?

1—The differential in aileron travel is greater.
2—The wing's angle of attack is greater as the rollout is started.
3—The wing being raised is traveling faster through the air than the wing being lowered.
4—The wing being lowered is traveling faster through the air and producing more lift than the wing being raised.

**3216.** Which action is necessary to make the airplane turn?

1—Change the direction of thrust.
2—Change the direction of lift.
3—Yaw the aircraft.
4—Increase the angle of attack.

**3217.** What changes in aircraft control must be made to maintain altitude while the airspeed is being decreased?

1—Increase the angle of attack to compensate for the decreasing lift.
2—Increase the angle of attack to produce more lift than drag.
3—Decrease the angle of attack to compensate for the increasing drag.
4—Maintain a constant angle of attack until the desired airspeed is reached, then increase the angle of attack.

**3218.** The angle of attack of a wing directly controls the

1—amount of airflow above and below the wing.
2—point at which the center of gravity is located.
3—distribution of positive and negative pressure acting on the wing.
4—angle of incidence of the wing.

**3219.** Which of the following is a result of ground effect?

1—An increase in the wing's downwash with no increase in angle of attack.
2—An increase in wingtip vortices at a given angle of attack.
3—An increase in lift with no increase in angle of attack.
4—An increase in induced drag with no change in angle of attack.

**3220.** If the same angle of attack is maintained in ground effect as when out of ground effect, lift will

1—increase, and induced drag will decrease.
2—decrease, and parasite drag will increase.
3—increase, and induced drag will increase.
4—decrease, and parasite drag will decrease.

**3221.** Which statement is generally true regarding wing camber of a glider's airfoil?

1—There is no camber on either the upper or lower surface of the wing.
2—The camber is the same on both the upper and lower surface of the wing.
3—The camber is less on the upper wing surface than it is on the lower surface of the wing.
4—The camber is greater on the upper wing surface than it is on the lower surface of the wing.

**3222.** A rectangular wing, as compared to other wing planforms, has a tendency to stall first at the

1—wing root providing adequate stall warning.
2—wingtip providing adequate stall warning.
3—wing root providing inadequate stall warning.
4—wingtip providing inadequate stall warning.

**3223.** In comparing a straight wing and a sweptback wing of the same wing area and wing loading, the sweptback wing has the advantage of

1—lower stalling speed.
2—greater mean aerodynamic chord.
3—increased longitudinal stability.
4—higher critical Mach number.

**3224.** Which adverse stability characteristic is caused by sweepback?

1—Increase of dutchroll tendency.
2—Increase of longitudinal static stability.
3—Increase of Mach tuck tendency.
4—Increase of critical Mach number.

**3225.** The purpose of aircraft wing dihedral angle is to

1—increase lateral stability.
2—increase longitudinal stability.
3—increase lift coefficient of the wing.
4—decrease drag coefficient of the wing.

**3226.** Aspect ratio of a wing is defined as the ratio of the

1—wingspan to the wing root.
2—square of the chord to the wingspan.
3—wingspan to the mean aerodynamic chord.
4—wing spar to the main compression rib.

**3227.** A wing with a very high aspect ratio (in comparison with a low aspect ratio wing) will have

1—increased drag at high angles of attack.
2—decreased wing performance when in a climbing attitude.
3—poor control qualities at low arispeeds.
4—a low stall speed.

**3228.** At a constant velocity in airflow, a high aspect ratio wing will have (in comparison with a low aspect ratio wing)

1—decreased drag, especially at a high angle of attack.
2—increased drag, especially at a high angle of attack.
3—increased drag, especially at a low angle of attack.
4—decreased wing performance when in a climbing attitude.

**3229.** The primary purpose of high lift devices is to increase the

1—$L/D_{max}$.
2—lift at slow speeds.
3—drag and reduce airspeed.
4—approach and landing speeds.

**3230.** The use of a slot in the leading edge of the wing enables the airplane to land at a slower speed because it

1—changes the camber of the wing.
2—increases the ground effect.
3—decelerates the upper surface boundary layer air.
4—delays the stall to a higher angle of attack.

**3231.** Which statement is true concerning the aerodynamic conditions which occur during a spin entry?

1—After a full stall, both wings remain in a stalled condition throughout the rotation.
2—After a full stall, the wing that drops continues in a stalled condition while the rising wing regains and continues to produce some lift, causing the rotation.
3—After a partial stall, both wings continue to produce some lift which causes the rotation.
4—After a partial stall, the wing that drops remains in a stalled condition while the rising wing regains and continues to produce lift, causing the rotation.

**3232.** Refer to Figure 13. At the airspeed represented by point a, in steady flight, the aircraft will

1—be structurally damaged by full deflection of the controls.
2—have its maximum lift/drag ratio.
3—have its minimum lift/drag ratio.
4—be developing its maximum coefficient of lift.

**3233.** Refer to Figure 13. At an airspeed represented by point b, in steady flight, the pilot can expect to obtain the aircraft's

1—minimum glide range in still air.
2—maximum glide range in still air.
3—maximum coefficient of lift.
4—minimum coefficient of lift.

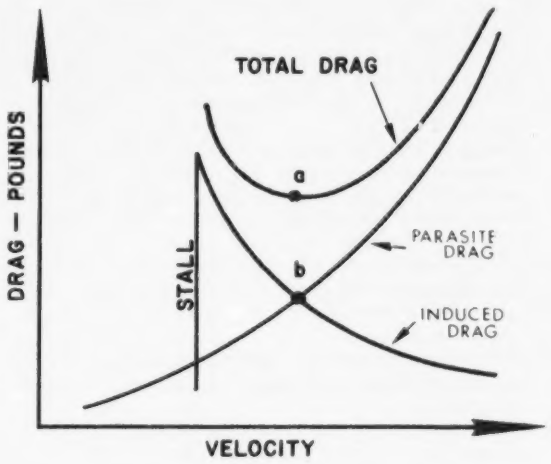



Figure 13

**3234.** Which of the following aircraft characteristics contribute to spiral instability?

1—Strong static directional stability and strong dihedral effect.
2—Strong static directional stability and weak dihedral effect.
3—Weak static directional stability and weak dihedral effect.
4—Weak static directional stability and strong dihedral effect.

**3235.** The most desirable type of stability for an aircraft to possess is

1—neutral static stability.
2—neutral dynamic stability.
3—positive static stability.
4—positive dynamic stability.

**3236.** The tendency of an aircraft to develop forces which restore it to its original condition, when disturbed from a condition of steady flight, is known as

1—controllability.
2—maneuverability.
3—stability.
4—balance.

**3237.** The tendency of an aircraft to develop forces that further remove the airplane from its original position, when disturbed from a condition of steady flight, is known as

1—dynamic instability.
2—neutral static stability.
3—static instability.
4—positive static stability.

**3238.** If the aircraft's nose initially tends to return to its original position after the elevator control is pressed forward and released, the airplane displays

1—negative static stability.
2—positive static stability.
3—negative dynamic stability.
4—neutral dynamic stability.

**3239.** If the aircraft's nose initially tends to move farther from its orginal position after the elevator control is pressed forward and released, the aircraft displays

1—negative static stability.
2—positive static stability.
3—positive dynamic stability.
4—neutral dynamic stability.

**3240.** If the aircraft's nose remains in the new position after the elevator control is pressed forward and released, the aircraft displays

1—negative static stability.
2—neutral dynamic stability.
3—positive static stability.
4—neutral static stability.

**3241.** If the airspeed increases and decreases during longitudinal phugoid oscillations, the aircraft

1—can be easily controlled by the pilot.
2—can not be controlled by the pilot.
3—will display poor trimming qualities.
4—is constantly changing angle of attack making it difficult for the pilot to reduce the magnitude of the oscillations.

**3242.** Refer to Figure 14. While rolling into a right turn, if the inclinometer appears as illustrated in A, the HCL and CF vectors would be acting on the aircraft as illustrated in

1—4, and more right rudder pressure is needed to center the ball.
2—2, and more right rudder pressure is needed to center the ball.
3—4, and more left rudder pressure is needed to center the ball.
4—2, and more left rudder pressure is needed to center the ball.

**3243.** Refer to Figure 14. While rolling into a right turn, if the inclinometer appears as illustrated in C, the HCL and CF vectors would be acting on the aircraft as illustrated in

1—3, and less right rudder pressure is needed to center the ball.
2—5, and more right rudder pressure is needed to center the ball.
3—5, and less right rudder pressure is needed to center the ball.
4—3, and more right rudder pressure is needed to center the ball.

**3244.** Refer to Figure 14. While rolling out of a left turn, if the inclinometer appears as illustrated in A, the HCL and CF vectors would be acting on the aircraft as illustrated in

1—2, and more right rudder pressure is needed to center the ball.
2—2, and more left rudder pressure is needed to center the ball.
3—4, and more left rudder pressure is needed to center the ball.
4—4, and more right rudder pressure is needed to center the ball.

**3245.** A propeller rotating clockwise as seen from the rear, creates a spiraling slipstream that tends to rotate the aircraft to the

1—right around the vertical axis, and to the right around the longitudinal axis.
2—right around the vertical axis, and to the left around the longitudinal axis.
3—left around the vertical axis, and to the right around the longitudinal axis.
4—left around the vertical axis, and to the left around the longitudinal axis.

**3246.** The left turning tendency of an aircraft caused by P-factor is the result of the

1—clockwise rotation of the engine and the propeller turning the aircraft counterclockwise.
2—propeller blade descending on the right, producing more thrust than the ascending blade on the left.
3—gyroscopic forces applied to the rotating propeller blades acting 90° in advance of the point the force was applied.
4—spiral characteristics of the slipstream air being forced rearward by the rotating propeller.

**3247.** The reason for variations in geometric pitch (twisting) along a propeller blade is that it

1—permits a relatively constant angle of incidence along its length when in cruising flight.
2—prevents the portion of the blade near the hub to stall during cruising flight.
3—permits a relatively constant angle of attack along its length when in cruising flight.
4—prevents asymmetrical loading of the propeller during a climb.

**3248.** With regard to gyroscopic precession, when a force is applied at a point on the rim of a spinning disc the resultant force acts in which direction and at what point?

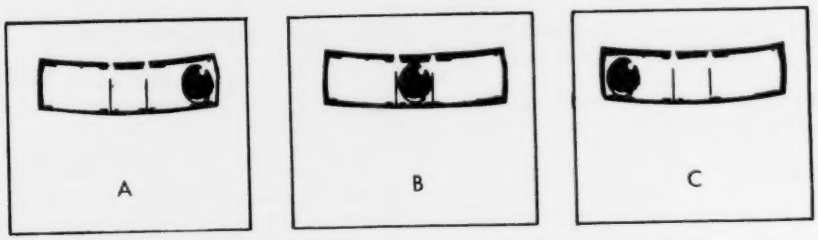
1—In the same direction as the applied force, at the point of the applied force.
2—In the opposite direction of the applied force, at the point of the applied force.
3—In the same direction as the applied force, 90° ahead in the plane of rotation.
4—In the opposite direction of the applied force, 90° ahead in the plane of rotation.

**3249.** The critical engine on most light multiengine airplanes with clockwise rotating propellers, is the

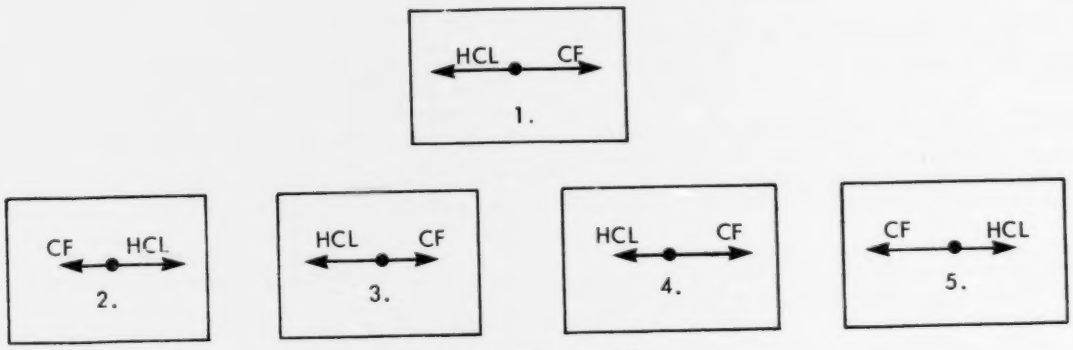
1—right engine, because of the additional force created by the "P-factor" of the right propeller.
2—left engine, because of the additional force created by the "P-factor" of the left propeller.
3—right engine, because of the additional force created by the "P-factor" of the left propeller.
4—left engine, because of the additional force created by the "P-factor" of the right propeller.

**3250.** In a multiengine airplane with engines which rotate clockwise, the "critical" engine is the

1—left engine, because the right engine center of thrust is further away from the centerline of the fuselage.
2—left engine, because the right engine center of thrust is closer to the centerline of the fuselage.
3—right engine, because the left engine center of thrust is further away from the centerline of the fuselage.
4—right engine, because the left engine center of thrust is closer to the centerline of the fuselage.




INCLINOMETER




FORCE VECTORS

NOTE: HCL DENOTES HORIZONTAL COMPONENT OF LIFT.
CF DENOTES CENTRIFUGAL FORCE.
LENGTH OF ARROWS DENOTES MAGNITUDE OF FORCE.

Figure 14

**3251.** On a multiengine airplane, where the propellers rotate in the same direction, why is the loss of power on one engine more critical than the loss of power on the other engine?

1—Resistance to torque from one engine imposes a greater load on one wing, thereby increasing the stalling speed of that wing.
2—The asymmetric propeller thrust or "P-factor," results in the center of thrust from one engine being further from the airplane centerline than the center of thrust from the other engine.
3—Because the "corkscrew" pattern of airflow from one propeller is less effective against the airflow from the "critical" engine.
4—The torque reaction from operation of the critical engine is more severe around the vertical as well as the longitudinal axis.

**3252.** Rotor blade rotation during powered flight in a gyroplane is produced by the

1—interaction between engine propeller thrust and rotor blade drag.
2—transfer of engine power through the clutch to the rotor shaft.
3—drag on the rotor blade airfoil.
4—horizontal component of rotor lift.

**3253.** The rotor RPM may momentarily increase during the flare portion of a flare-type autorotation. This increase in rotor RPM is due to

1—a decrease in rotor drag brought about by a lack of forward motion.
2—the additional lift derived from the increased angle of attack of the main rotor disc.
3—an increased down-wash velocity.
4—ground effect.

**3254.** The rotor blade pitch angle is the acute angle between the blade chord line and the

1—direction of the relative wind.
2—rotor plane of rotation.
3—angle of attack.
4—horizon.

**3255.** Rotor blade flapping action is

1—an aerodynamic reaction to high-speed flight only.
2—an undesirable reaction to changes in airspeed and blade angle of attack.
3—a desirable design feature which compensates for dissymmetry of lift.
4—most pronounced in power-off descents.

**3256.** In forward flight and with the blade-pitch angle constant, the increased lift on the advancing blade will cause it to

1—flap down, causing an increase in the angle of attack.
2—flap up, causing a decrease in the angle of attack.
3—flap up, causing an increase in the angle of attack.
4—flap down, causing a decrease in the angle of attack.

**3257.** In certain single-rotor helicopters, the mast is rigged away from the vertical position by approximately 1°. This slight vertical offset is primarily for the purpose of counteracting

1—precession.
2—yaw.
3—torque.
4—drift.

**3258.** Coning is caused by the combined forces of

1—lift and centrifugal force.
2—drag, weight, and gravity.
3—weight and centrifugal force.
4—gravity and thrust.

**3259.** As each blade flaps up and down, it produces a shift of the center of its mass. When the blade flaps up, the CG moves closer to its axis of rotation, giving that blade a tendency to

1—decelerate its rotational velocity; this tendency is known as drag effect.
2—accelerate its rotational velocity; this tendency is known as Coriolis effect.
3—stabilize its rotational velocity, thus compensating for dissymmetry of lift.
4—decelerate its rotational velocity; this tendency is known as translating tendency.

**3260.** The forward speed of a rotorcraft is restricted primarily by

1—air density.
2—high-frequency vibrations.
3—dissymmetry of lift.
4—transverse flow effect.

**3261.** What is dissymmetry of lift?

1—The difference in lift that exists between the rearward part and the forward part of the rotor disc during forward flight.
2—A term used to differentiate between air flowing downward through the rotor in powered flight and upward through the rotor in autorotative flight.
3—The additional lift obtained when entering horizontal flight.
4—The difference in lift that exists between the advancing blade half and the retreating blade half of the disc area.

**3262.** When a rotorcraft transitions from straight-and-level flight into a 30° bank while maintaining a constant altitude, the total lift force must

1—remain constant, and the load factor will increase.
2—remain constant, and the load factor will decrease.
3—increase, and the load factor will decrease.
4—increase, and the load factor will increase.

**3263.** During forward cruising flight at constant airspeed and altitude, the individual rotor blades, when compared to each other, are operating at

1—unequal airspeed, equal angles of attack, and unequal lift moment.
2—constant airspeed, unequal angles of attack, and unequal lift moment.
3—unequal airspeed, unequal angles of attack, and equal lift moment.
4—constant airspeed, equal angles of attack, and equal lift moment.

**3264.** Density altitude increases with

1—increases in temperature and moisture content of the air, and a decrease in pressure.
2—increases in pressure, temperature, and moisture content of the air.
3—an increase in temperature only.
4—increases in pressure and temperature, and a decrease in moisture content of the air.

**3265.** Of the following factors, which would increase the density altitude of a given airport?

1—An increase in atmospheric pressure.
2—An increase in air temperature.
3—A decrease in relative humidity.
4—An increase in altimeter setting.

**3266.** How does high density altitude affect rotorcraft performance?

1—It increases rotor drag, which requires more power for normal flight.
2—It increases rotor efficiency, but decreases engine efficiency.
3—Engine and rotor efficiency is reduced.
4—Engine and rotor efficiency is increased.

**3267.** Which statement is true regarding takeoff performance with high density altitude conditions?

1—The acceleration rate is slower because the engine and propeller efficiency is reduced.
2—The acceleration rate will increase since the lighter air creates less drag.
3—A shorter distance is required to accelerate to lift-off speed due to the reduced drag of lighter air.
4—A higher than normal indicated airspeed is required to produce sufficient lift since the air is less dense.

**3268.** If the atmospheric pressure and temperature remain the same, how would an increase in humidity affect takeoff performance?

1—Shorter takeoff distance; the air is less dense.
2—Longer takeoff distance; the air is more dense.
3—Longer takeoff distance; the air is less dense.
4—Shorter takeoff distance; the air is more dense.

**3269.** As altitude increases, the indicated airspeed at which a given airplane stalls in a particular configuration will

1—decrease as the true airspeed decreases.
2—decrease as the true airspeed increases.
3—remain the same as at low altitude.
4—increase because the air density becomes less.

**3270.** An aircraft is flying at a constant power setting and constant indicated altitude. As a result of a decrease in the outside air temperature, the true airspeed will

1—decrease, and the true altitude will increase.
2—decrease, and the true altitude will decrease.
3—increase, and the true altitude will increase.
4—increase, and the true altitude will decrease.

**3271.** An aircraft is flying at a constant indicated altitude and a constant power setting. As a result of an increase in the outside air temperature, the true airspeed will

1—increase, and the true altitude will decrease.
2—increase, and the true altitude will increase.
3—decrease, and the true altitude will decrease.
4—decrease, and the true altitude will increase.

**3272.** As density altitude increases, which will occur if a constant indicated airspeed is maintained in a no-wind condition?

1—True airspeed increases; groundspeed increases.
2—True airspeed increases; groundspeed decreases.
3—True airspeed decreases; groundspeed decreases.
4—True airspeed decreases; groundspeed increases.

**3273.** The most unfavorable combination of conditions for rotorcraft performance is

1—low density altitude, low gross weight, and calm wind.
2—low density altitude, high gross weight, and strong wind.
3—high density altitude, high gross weight, and calm wind.
4—high density altitude, high gross weight, and strong wind.

**3274.** The most favorable combination of conditions for rotorcraft performance is

1—low density altitude, high gross weight, and calm to light wind.
2—low density altitude, low gross weight, and moderate to strong wind.
3—high density altitude, low gross weight, and moderate to strong wind.
4—high density altitude, low gross weight, and calm to light wind.

**3275.** If all other factors remain the same, an increase in relative humidity will

1—increase the hovering ceiling because the air is more dense.
2—decrease the hovering ceiling because the air is more dense.
3—decrease the hovering ceiling because the air is less dense.
4—have no affect on the hovering ceiling.

**3276.** What affect does an uphill runway slope have upon takeoff performance?

1—Increases takeoff distance.
2—Incrreases takeoff speed.
3—Decreases takeoff distance.
4—Decreases takeoff speed.

**3277.** The best L/D ratio of a glider occurs when parasite drag is

1—equal to total drag.
2—equal to induced drag.
3—greater than induced drag.
4—less than induced drag.

**3278.** The best L/D ratio of a glider is a value that

1—varies depending upon the weight being carried.
2—varies depending upon the angle of attack required for different weights being carried.
3—remains constant regardless of airspeed changes.
4—remains constant and is independent of the weight being carried.

**3279.** Which is true about the effect on a glider's performance by the addition of ballast or weight?

1—The glide ratio at a given airspeed will increase.
2—A higher airspeed is required to obtain the same glide ratio as when lightly loaded.
3—The heavier the glider is loaded, the less the glide ratio will be at all airspeeds.
4—A heavily loaded glider takes a longer time than one lightly loaded to fly from one thermal to the next.

**3280.** Whenever climbing or descending through an inversion or wind shear zone, the pilot should be alert for which of the following changes in aircraft performance?

1—A sudden change in airspeed.
2—A fast rate of climb and a slow rate of descent.
3—A sudden surge of thrust.
4—A sudden decrease in power.

**3281.** Which statement is true relating to the effect of low level wind shear on aircraft performance?

1—A tailwind which shifts to a headwind causes an initial increase in airspeed.
2—A tailwind which shifts to a headwind causes the aircraft to pitch down.
3—A headwind which shifts to a tailwind causes an initial increase in airspeed.
4—A headwind which shifts to a tailwind causes the aircraft to pitch up.

**3282.** Which statement is true relating to the effect of low level wind shear on aircraft performance?

1—A tailwind which shifts to a headwind causes an initial decrease in airspeed.
2—A tailwind which shifts to a headwind causes the aircraft to pitch down.
3—A headwind which shifts to a tailwind causes an initial increase in airspeed.
4—A headwind which shifts to a tailwind causes the aircraft to pitch down.

**3283.** During departure when low level wind shifts to a tailwind or rapidly decreasing headwind, aircraft performance will

1—initially increase, then decrease.
2—remain unchanged.
3—decrease.
4—increase.

**3284.** When one engine fails on a twin-engine airplane, the resulting performance loss

1—is approximately 50 percent since 50 percent of the normally available thrust is lost.
2—causes the airplane to become uncontrollable, unless power output of the operating engine is reduced.
3—may reduce the rate of climb by 80 percent or more.
4—reduces cruise indicated airspeed by 50 percent or more.

**3285.** What is the significance of the blue radial line on the airspeed indicator of a light multiengine airplane and when is it to be used?

1—It indicates the speed which will provide the maximum altitude gain in a given time when one engine is inoperative and should be used for climb and final approach during engine-out operations.
2—It indicates the speed which will provide the greatest height for a given distance of forward travel when one engine is inoperative and should be used for all climbs during engine-out operations.
3—It indicates the minimum speed at which the airplane is controllable when the critical engine is suddenly made inoperative and should be used at all altitudes when an engine is inoperative.
4—It indicates the minimum safe single-engine speed and should be used during both normal and engine-out operations.

**3286.** When operating a light multiengine airplane at $V_{MC}$, the pilot should expect performance to be sufficient to maintain

1—heading.
2—heading and altitude.
3—heading, altitude, and be able to climb at 50 ft./min.
4—altitude.

**3287.** For an airplane with unsupercharged reciprocating engines, $V_{MC}$

1—increases with altitude.
2—decreases with altitude.
3—is not affected by altitude.
4—increases or decreases directly with temperature changes.

**3288.** Which of the following statements is true regarding the operation of a multiengine airplane with one engine inoperative?

1—Banking toward the operating engine increases $V_{MC}$.
2—Banking toward the inoperative engine increases $V_{MC}$.
3—$V_{MC}$ is a designed performance factor which must be proven during type certification and will not change as long as the ball is centered with appropriate rudder pressure.
4—Loss of directional control is not likely to occur as long as adequate rudder pressure is applied to keep the ball centered.

**3289.** Which condition causes $V_{MC}$ to be the highest?

1—CG is at the most forward allowable position.
2—CG is at the most rearward allowable position.
3—Gross weight is at the maximum allowable value.
4—Outboard fuel tanks are full and inboard fuel tanks are empty.

**3290.** How does increased weight affect the takeoff distance of an airplane?

1—Every airplane has the same acceleration factor under the same atmospheric conditions, but a higher airspeed is needed to produce the additional lift required.
2—Every airplane has the same acceleration factor with the same power output, but a higher airspeed is needed to overcome the increased ground effect.
3—The airplane will accelerate more slowly with the same power output, and a higher airspeed is required to generate necessary lift for takeoff.
4—The airplane will accelerate more slowly with the same power output, but the same airspeed is required to generate necessary lift for takeoff.

**3291.** An airplane is loaded with the CG aft of the aft limit. What effect will this have on controllability?

1—Stall and spin recovery may be difficult or impossible.
2—A stall will occur at a higher indicated airspeed due to the greater down loading on the elevator.
3—A power-off, full-stall landing is more difficult because of the increased ground effect on the elevator.
4—A stall will occur at a lower airspeed, but recovery will be easier because of reduced wing loading.

**3292.** The stalling speed of an aircraft will be highest when the aircraft is loaded with a

1—high gross weight and aft CG.
2—low gross weight and forward CG.
3—low gross weight and aft CG.
4—high gross weight and forward CG.

**3293.** An airplane is loaded with the CG at the aft limit. What are the performance characteristics compared with the CG at the forward limit?

1—The aft CG provides the highest stall speed and cruising speed.
2—The aft CG provides the lowest stalling speed, the highest cruising speed, and least stability.
3—Stalling speed and pitch stability are the only factors affected by CG location.
4—Cruising speed is lower because of more induced drag created by the elevator or stabilizer being required to provide more lift with an aft CG.

**3294.** If the CG of an airplane is moved from the aft limit to beyond the forward limit, how will it affect the cruising and stalling speed?

1—Increase the cruising speed and decrease the stalling speed.
2—Decrease the cruising speed and increase the stalling speed.
3—Increase both the cruising speed and stalling speed.
4—Decrease both the cruising speed and stalling speed.

**3295.** When an aircraft's forward CG limit is exceeded, it will affect the flight characteristics of the aircraft by producing

1—very light elevator control forces which make it easy to inadvertently overstress the aircraft.
2—decreased stability and greater ease in establishing the proper landing and takeoff attitude.
3—improved performance since it reduces the induced drag.
4—higher stalling speeds and more longitudinal stability.

**3296.** In conventional airplanes, as the CG moves aft, the airplanes become

1—more stable, yet more difficult to control.
2—less stable, yet easier to control.
3—less stable and less controllable.
4—more stable and controllable as long as the aft CG is not exceeded.

**3297.** What is characteristic of the indicated airspeed if the CG is at the most forward allowable position and constant power and altitude are maintained?

1—Indicated airspeed will be greater than it would be with the CG in the most rearward allowable position.
2—Indicated airspeed will be less than it would be with the CG in the most rearward allowable position.
3—There is not relationship between CG location and indicated airspeed.
4—indicated airspeed will be less than it would be at the most rearward CG position, but not less than it would be with the CG midway between the forward and aft limits.

**3298.** To maintain level cruising flight in an airplane which is loaded with the CG at the forward limit, an additional download must be imposed on the horizontal stabilizer. This in turn produces

1—an additional load which the wing must support.
2—a lesser load that must be supported by the wing.
3—a decrease in drag and results in a faster airspeed.
4—a decrease in drag and reduces the stalling speed.

**3299.** Under which condition is a forward CG most critical?

1—On landing.
2—On takeoff.
3—During a spin.
4—When in an unusual attitude.

**3300.** As the center of gravity location is changed, recovery from stalls becomes progressively

1—less difficult as the CG moves rearward.
2—more difficult as the CG moves forward.
3—less difficult as the CG moves either forward or rearward.
4—more difficult as the CG moves rearward.

**3301.** If the CG is located aft of allowable limits, the pilot may find it impossible to

1—fly in the lower allowable airspeed range due to insufficient aft cyclic control.
2—raise the nose, if necessary, during flight in gusty wind conditions.
3—recognize this out-of-balance condition when hovering in strong headwinds.
4—fly in the upper allowable airspeed range due to insufficient forward cyclic control.

**3302.** While hovering immediately after liftoff, an excessive amount of forward cyclic stick is required to maintain the desired position over the ground. If a takeoff is made and flight continued, this situation will be

1—improved if the fuel tanks are located forward of the CG.
2—aggravated if the fuel tanks are located aft of the CG.
3—unimproved regardless of the location of the fuel tanks.
4—aggravated if the fuel tanks are located forward of the CG.

**3303.** A helicopter is loaded in such a manner that the CG is located aft of the aft allowable CG limit. Which statement is true about this hazardous situation?

1—Should the helicopter pitchup due to gusty winds during high-speed flight, there may not be sufficient forward cyclic control available to lower the nose.
2—This condition would become more hazardous as fuel is consumed, if the main fuel tank is located aft of the rotor mast.
3—In case of an autorotation, sufficient aft cyclic control may not be available to flare properly.
4—This out-of-balance situation would be easily recognized when hovering in a strong headwind.

**3304.** If the nosewheel of an airplane moves aft during gear retraction, how would this aft movement affect the CG location of that airplane? It would

1—have no effect on the CG location.
2—cause the CG location to move aft.
3—cause the CG location to move forward.
4—cause the CG location to move, but the direction of movement would be unpredictable.

**3305.** If the landing gear on an airplane moves forward during retraction, the

1—total moments will decrease.
2—total moments will remain the same.
3—total moments will increase.
4—center of gravity will remain the same.

**3306.** The center of gravity of an aircraft is computed along the

1—lateral axis.
2—vertical axis.
3—longitudinal axis.
4—horizontal axis.

**3307.** The center of gravity of an aircraft can be determined by

1—multiplying total weight by total moments.
2—dividing total arms by total moments.
3—dividing total moments by total weight.
4—multiplying total arms by total weight.

**3308.** What is a definition of zero fuel weight?

1—Basic operating weight plus maximum capacity of passengers and cargo.
2—Empty weight plus passengers and cargo.
3—Takeoff weight minus fuel to destination and alternate.
4—Basic operating weight plus payload.

**3309.** Refer to Figure 15. How should the 1000-lb. weight be shifted to balance the plank on the fulcrum?

1—15 in. to the right.
2—15 in. to the left.
3—5 in. to the right.
4—5 in. to the left.

**3310.** Refer to Figure 15. How should the 500-lb. weight be shifted to balance the plank on the fulcrum?

1—10 in. to the right.
2—10 in. to the left.
3—30 in. to the right.
4—30 in. to the left.

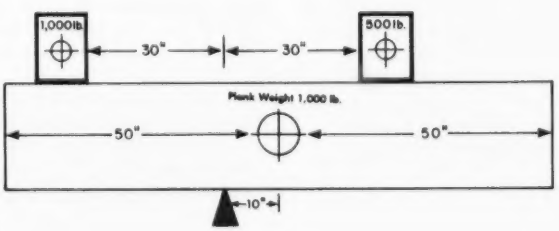



Figure 15

**3311.** (Refer to Figure 16.) How should the 250-lb. weight be shifted to balance the plank on the fulcrum?

1—2 in. to the left.
2—2 in. to the right.
3—2.5 in. to the left.
4—2.5 in. to the right.

**3312.** (Refer to Figure 16.) How should the 200-lb. weight be shifted to balance the plank on the fulcrum?

1—2 in. to the left.
2—2 in. to the right.
3—2.5 in. to the left.
4—2.5 in. to the right.

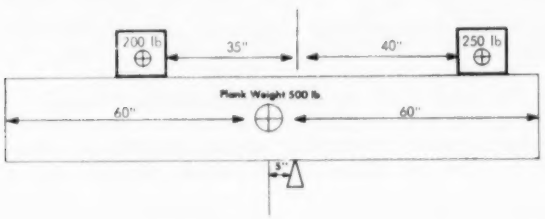



Figure 16

**3313.** (Refer to Figure 17.) How should the 500-lb. weight be shifted to balance the plank on the fulcrum?

1—1 in. to the left.
2—1 in. to the right.
3—4.5 in. to the left.
4—4.5 in. to the right.

**3314.** (Refer to Figure 17.) How should the 250-lb. weight be shifted to balance the plank on the fulcrum?

1—8.4 in. to the right.
2—8.4 in. to the left.
3—2 in. to the right.
4—2 in. to the left.

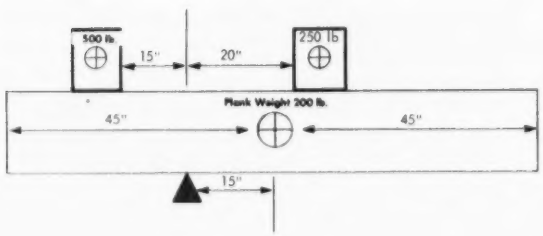



Figure 17

**3315.** (Refer to Figure 18.) If 50 lb. of weight is located at point X and 100 lb. at point Z, how much weight must be located at point Y to balance the plank?

1—30 lb.
2—50 lb.
3—300 lb.
4—500 lb.

**3316.** (Refer to Figure 18.) If 50 lb of weight is located at point X and 100 lb. at point Y, how much weight must be located at point Z to balance the plank?

1—50 lb.
2—100 lb.
3—150 lb.
4—500 lb.

**3317.** (Refer to Figure 18.) If 50 lb. of weight are located at points X, Y, and Z, how would point Z have to be shifted to balance the plank?

1—2.5 in. to the left.
2—2.5 in. to the right.
3—25 in. to the left.
4—25 in. to the right.

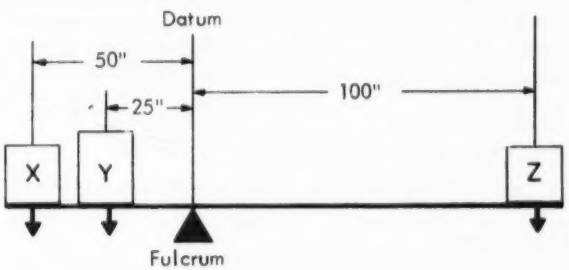



Figure 18

**3318.** GIVEN:

Weight A.....120 lb. at 15" aft of datum
Weight B.....200 lb. at 117" aft of datum
Weight C.....75 lb. at 195" aft of datum

Based on this information, the CG would be located how far aft of datum?

1—82.0".
2—109.0".
3—121.7".
4—100.8".

**3319.** GIVEN:

Weight X.....130 lb. at 17" aft of datum
Weight Y.....110 lb. at 110" aft of datum
Weight Z.....75 lb. at 210" aft of datum

Based on this information, the CG would be located how far aft of datum?

1—89.1".
2—95.4".
3—106.9".
4—112.3".

**3320.** GIVEN:

Total weight.....2,900 lb.
CG location.....station 115.0
Aft CG limit.....station 116.0

The maximum weight that could be added at station 130.0 without exceeding the aft CG limit would be

1—317 lb.
2—207 lb.
3—140 lb.
4—14 lb.

**3321.** GIVEN:

Total weight.....2,340 lb.
CG location.....station 103.0

What would be the new CG location if 135 lb. of weight were added at station 109.0?

1—Station 102.7.
2—Station 103.3.
3—Station 104.2.
4—Station 109.3.

**3322.** GIVEN:

Aircraft weight.....6,230 lb.
CG location.....station 79

What is the location of the CG if 90 lb. are removed from station 140?

1—79.9.
2—78.1.
3—80.1.
4—77.9.

**3323.** GIVEN:

Aircraft weight.....7,152 lb.
CG location.....station 82

What is the location of the CG if 146 lb. are removed from station 150?

1—83.4.
2—82.7.
3—81.3.
4—80.6.

**3324.** GIVEN:

Total weight.....7,500 lb.
CG location.....station 80.5
Aft CG limit.....station 79.5

How much weight must be shifted from station 150.0 to station 30.0 to move the CG to exactly the aft CG limit?

1—62.5 lb.
2—65.8 lb.
3—68.9 lb.
4—73.5 lb.

**3325.** GIVEN:

Total weight.....2,800 lb.
CG location.....station 120.0
Forward CG limit.....station 117.0

Could 100 lb. of weight be shifted from station 130.0 to station 30.0 without exceeding the forward CG limit?

1—No, the new CG would be located at station 116.42.
2—No, the new CG would be located at station 116.89.
3—Yes, the new CG would be located at station 117.89.
4—Yes, the new CG would remain at station 120.0.

**3326.** GIVEN:

Total weight.....4,750 lb.
CG location.....station 115.8
Aft CG limit.....station 118.0

Could 100 lb. of weight be shifted from station 30.0 to station 120.0 without exceeding the aft CG limit?

1—Yes, the CG would remain at station 115.8.
2—Yes, the new CG would be located at station 117.69.
3—No, the new CG would be located at station 118.15.
4—No, the new CG would be located at station 118.25.

**3327.** Which instrument would be affected by excessively low pressure in the airplane's vacuum system?

1—Vertical velocity indicator.
2—Airspeed indicator.
3—Pressure altimeter.
4—Heading indicator.

**3328.** If both the ram-air input and drain hole of the pitot system are blocked, what airspeed indication can be expected?

1—No variation of indicated airspeed in level flight even if large power changes are made.
2—Decrease of indicated airspeed during a climb.
3—Constant indicated airspeed during a descent.
4—Zero indicated airspeed until blockage is removed.

**3329.** Pitot static system errors are generally the greatest in which range of airspeed?

1—Maneuvering speed.
2—High airspeed.
3—Low airspeed.
4—Cruising airspeed.

**3330.** During power-off stalls with flaps full down, the stall occurs and the pointer on the airspeed indicator shows a speed less than the minimum limit of the white arc on the indicator. This is most probably due to

1—installation error in the pitot-static system.
2—a malfunction in the pitot-static system.
3—a high density altitude.
4—a low density altitude.

**3331.** If a pitot tube is clogged, which of these instruments would be affected?

1—Vertical speed indicator.
2—Altimeter.
3—Airspeed indicator.
4—Turn needle.

**3332.** If the static pressure tubes are broken inside a pressurized cabin during a high-altitude flight, the altimeter would probably indicate.

1—higher than actual flight altitude.
2—sea level.
3—a fluctuating altitude.
4—lower than actual flight altitude.

**3333.** Which statement is true about the effect of temperature changes on the indications of a sensitive altimeter?

1—Colder-than-standard temperatures will place the aircraft lower than the altimeter indicates.
2—Warmer-than-standard temperatures will place the aircraft lower than the altimeter indicates.
3—Colder-than-standard temperatures will place the aircraft higher than the altimeter indicates.
4—Temperature changes have no effect on the altimeter indications.

**3334.** A possible result of using the emergency alternate source of static pressure inside the cabin of an unpressurized airplane is the

1—airspeed indicator may indicate less than normal.
2—altimeter may indicate an altitude higher than the actual altitude being flown.
3—vertical velocity indicator may indicate a continuous descent.
4—altimeter may indicate an altitude lower than the actual altitude being flown.

**3335.** Fuel/air ratio is the ratio between the

1—volume of fuel and volume of air entering the cylinder.
2—volume of fuel and volume of air entering the carburetor.
3—weight of fuel and weight of air entering the cylinder.
4—weight of fuel and weight of air entering the carburetor.

**3336.** Which statement is true regarding fouling of the spark plugs of an aircraft engine?

1—Excessive heat in the combustion chamber of a cylinder causes oil to form on the center electrode of a spark plug and this fouls the plug.
2—Spark plug fouling results from operating with an excessively rich mixture.
3—Permitting the engine to idle for a long period of time on the ground is the best way to clear fouled spark plugs.
4—Carbon fouling of the spark plugs is caused primarily by operating an engine at excessively high cylinder head temperatures.

**3337.** Detonation in an aircraft engine is most likely to occur whenever

1—the engine is operated under conditions which cause the fuel mixture to burn instantaneously.
2—the fuel/air ratio is such that the mixture burns extremely slow.
3—one spark plug misfires under high compression.
4—the fuel being used is of a higher grade than recommended by the engine manufacturer.

**3338.** The operating principle of float-type carburetors is based on the

1—automatic metering of air at the venturi as the aircraft gains altitude.
2—difference in air pressure at the venturi throat and the air inlet.
3—increase in air velocity in the throat of a venturi causing an increase in air pressure.
4—measurement of the fuel flow into the induction system.

**3339.** When the pilot leans the mixture control, which of the following is being accomplished?

1—The volume of air entering the carburetor is being reduced.
2—The amount of fuel entering the combustion chamber is being increased.
3—The volume of air entering the carburetor is being increased.
4—The amount of fuel entering the combustion chamber is being reduced.

**3340.** What energy source is used to drive the turbines of a turbocharged airplane?

1—Electrical system.
2—Ignition system.
3—Engine exhaust gases.
4—Engine compressor.

**3341.** During climbing flight using a turbocharged airplane, the manifold pressure will remain approximately constant until

1—an outside air temperature of – 18° C is reached.
2—the waste gate is fully open and the turbine is operating at minimum speed.
3—the engine's critical altitude is reached.
4—the airplane's service ceiling is reached.

**3342.** During which stroke of a reciprocating engine is the gaseous mixture expanding within the cylinder?

1—Intake stroke.
2—Compression stroke.
3—Power stroke.
4—Exhaust stroke.

**3343.** To absorb maximum engine power and to develop maximum thrust, a constant-speed propeller should be adjusted to a blade angle which will produce a

1—small angle of attack and low RPM.
2—small angle of attack and high RPM.
3—large angle of attack and high RPM.
4—large angle of attack and low RPM.

**3344.** Which of the following statements is true regarding propeller efficiency?

1—Propeller efficiency is not affected by propeller slippage.
2—Propeller efficiency is the ratio of thrust horsepower to brake horsepower.
3—Propeller efficiency is the theoretical distance a propeller should advance in one revolution.
4—Propeller efficiency is the actual distance a propeller advances in one revolution.

**3345.** Concerning the advantages of an aircraft generator or alternator, select the true statement.

1—An alternator provides more electrical power at lower engine RPM than a generator.
2—A generator charges the battery during low engine RPM; therefore, the battery has less chance to become fully discharged, as often occurs with an alternator.
3—An alternator provides electrical current and eliminates the need for an aircraft to be equipped with a battery.
4—A generator always provides more electrical current than an alternator.

**3346.** An electrical system failure (battery and alternator) occurs during flight. In this situation, you would

1—probably experience failure of the engine ignition system, fuel gauges, aircraft lighting system, and avionics equipment.
2—probably experience engine failure due to the loss of the engine-driven fuel pump and also experience failure of the radio equipment, lights, and all instruments that require AC current.
3—experience avionics equipment failure.
4—experience high cylinder head temperature and low oil pressure indications.

**3347.** The purpose of an inverter is to

1—change direct current to alternating current.
2—stabilize the generator output.
3—monitor the performance of the electrical system.
4—stabilize the alternator output.

**3348.** Which statement is true regarding glider tow hooks?

1—The use of a belly hook or CG hook for aero tows would cause the glider to pitch up.
2—The use of a belly hook or CG hook for winch tows would cause the glider to pitch up.
3—The use of a belly hook or CG hook for auto tows does not allow the glider to reach an altitude as high as a nose hook would.
4—The use of a belly hook or CG hook for winch tows increases the drag and downward force on the glider's tail.

**3349.** The advantage of total energy compensators is that this system

1—adds the effect of stick thermals to the total energy produced by thermals.
2—compensates for air pressure changes while climbing or descending.
3—reduces climb and dive errors on variometer indications caused by airspeed changes.
4—includes a speed ring around the rim of the variometer.

**3350.** Which statement is true concerning total energy compensators?

1—The instrument will register climbs that result from stick thermals.
2—The instrument responds only to up and down air currents.
3—The instrument reacts to climbs and descents like a conventional rate-of-climb indicator.
4—The instrument indicates the average rate of climb in a thermal.

**3351.** Which statement is true concerning rotor systems?

1—The horizontal flapping hinge on a fully articulated rotor system enables the main rotor blades to hunt.
2—Dampers are normally incorporated in a fully articulated rotor system to prevent excessive motion about the spanwise axis of each rotor blade.
3—The main rotor blades of a semirigid rotor system can flap and feather as a unit.
4—The main rotor blades of a rigid rotor system can flap and drag but cannot feather.

**3352.** During the transition from pre-rotation to flight, all rotor blades change pitch

1—simultaneously to the same angle of incidence.
2—simultaneously but to different angles of incidence.
3—to the same degree at the same point in the cycle of rotation.
4—only as effective translational lift is attained.

**3353.** The main rotor blades of a fully-articulated rotor system can

1—flap and feather collectively.
2—flap, drag, and feather independently.
3—feather independently, but cannot flap or drag.
4—flap and drag independently, but can feather collectively only.

**3354.** What is the primary purpose of the freewheeling unit?

1—It provides speed reduction between the engine, main rotor system, and tail rotor system.
2—It provides disengagement of the engine from the rotor system for autorotation purposes.
3—It allows the engine to be started without driving the main rotor system.
4—It transmits engine power to the main rotor, tail rotor, generator/alternator, and other accessories.

**3355.** A high-frequency vibration that suddenly occurs during flight could be an indication of a defective

1—freewheeling unit.
2—ignition system.
3—transmission.
4—main rotor system.

**3356.** A high-frequency vibration in flight would most likely indicate potential trouble in the

1—main rotor system.
2—tail rotor due to improper rigging.
3—engine in most helicopters.
4—cyclic control linkage system.

**3357.** What is the primary purpose of the clutch?

1—It provides disengagement of the engine from the rotor system for autorotation.
2—It transmits engine power to the main rotor, tail rotor, generator/alternator, and other accessories.
3—It provides speed reduction between the engine and the main rotor system.
4—It allows the engine to be started without driving the main rotor system.

**3358.** Helicopter low-frequency vibrations are always associated with the

1—engine.
2—transmission.
3—tail rotor.
4—main rotor.

**3359.** Refer to Figure 19. Which is a fowler flap?

1—A.
2—B.
3—C.
4—D.

**3360.** Refer to Figure 19. Which is a plain flap?

1—A.
2—B.
3—C.
4—D.

**3361.** Refer to Figure 19. Which is a slotted flap?

1—A.
2—B.
3—C.
4—D.

**3362.** Refer to Figure 19. Which is a split flap?

1—A.
2—B.
3—C.
4—D.

Figure 19

**3363.** Which type of flap creates the greatest change in pitching moment?

1—Plain.
2—Slotted.
3—Split.
4—Fowler.

**3364.** Which type of flap creates the least change in pitching moment?

1—Plain.
2—Slotted.
3—Split.
4—Fowler.

**3365.** Which type of flap is characterized by large increases in lift coefficient with minimum changes in drag?

1—Plain.
2—Slotted.
3—Split.
4—Fowler.

**3366.** To help prevent overturning when taxiing light tricycle-gear airplanes (especially the high-wing type) in strong quartering tailwinds, the

1—aileron on the downwind side should be placed in the down position.
2—elevator should be placed in the up position.
3—aileron on the upwind side should be placed in the up position.
4—elevator should be placed in the down position.

**3367.** Which of the following aileron positions should you generally use when taxiing in strong quartering headwinds?

1—Aileron up on the side from which the wind is blowing.
2—Aileron down on the side from which the wind is blowing.
3—Neutral.
4—Aileron parallel to the ground on the side from which the wind is blowing.

**3368.** When taxiing with strong quartering tailwinds, which of the following aileron positions should be used?

1—Aileron parallel to the ground on the side from which the wind is blowing.
2—Neutral (streamlined position).
3—Aileron up on the side from which the wind is blowing.
4—Aileron down on the side from which the wind is blowing.

**3369.** Why should an airplane be headed into the wind for the pretakeoff check?

1—To obtain more accurate operating indications and to minimize engine overheating when the engine is run up.
2—To prevent excessive load factors which could occur during runup if a crosswind condition exists.
3—To prevent the need for more brake pressure to keep the airplane from moving foreward.
4—To reduce the risk of debris being picked up by the propeller.

**3370.** Name the four flight fundamentals involved in maneuvering an aircraft?

1—Aircraft power, pitch, bank, and trim.
2—Straight-and-level flight, turns, climbs, and descents.
3—Takeoffs, slow flight, fast flight, and stalls.
4—Starting, taxiing, takeoff, and landing.

**3371.** When explaining the techniques used when making short- and soft-field takeoffs, it would be correct to state that

1—the same technique should be used for both.
2—during soft-field takeoffs, lift-off should be made as soon as possible.
3—during short-field takeoffs, lift-off should be attempted only after best rate-of-climb speed is attained.
4—during soft-field takeoffs, lift-off should be made only when best angle-of-climb speed is attained.

**3372.** The indicated lift-off airspeed for short-field takeoffs in a particular airplane will normally be

1—lower than for soft- or rough-field takeoffs.
2—the same as for soft- or rough-field takeoffs.
3—greater than for soft- or rough-field takeoffs.
4—greater under tailwind conditions than that required under headwind conditions.

**3373.** What action should be taken if one engine of a light multiengine airplane becomes inoperative during takeoff?

1—If at or above $V_{MC}$, the takeoff may be continued if the airplane can be accelerated to rotation speed with the remaining runway.
2—If still on the runway at or above $V_{MC}$ the airplane may be accelerated to $V_{XSE}$ to assure controllability after lift-off.
3—If power loss occurs before lift-off, close both throttles and stay on the ground regardless of the amount of runway remaining.
4—If power loss occurs before lift-off, close both throttles and stay on the ground if sufficient runway remains to stop on the runway, otherwise continue takeoff.

**3374.** If runway and conditions permit, what would be an acceptable way to demonstrate the effect of high density altitude on takeoff performance?

1—Lift-off at an airspeed higher than normal.
2—Lift-off at an airspeed lower than normal.
3—Use full flaps during takeoff.
4—Use a reduced power setting during takeoff.

**3375.** Which would likely result in a slipping turn?

1—Increasing the rate of turn without increasing bank.
2—Holding bottom rudder in a turn.
3—Increasing the rate of turn without using rudder.
4—Not holding bottom rudder in a turn.

**3376.** Choose the true statement pertaining to a slip or skid in an airplane.

1—In a right descending turn, if excessive left rudder is applied to compensate for the decreased torque effect, a slip will result.
2—In a left climbing turn, if insufficient right rudder is applied to compensate for the increased torque effect, a slip will result.
3—A skid occurs when too much rudder is applied in the direction opposite the turn.
4—A skid occurs when the rate of turn is too slow for the amount of bank being used.

**3377.** During level turns in side-by-side airplanes, which is characteristic of student performance?

1—Diving during right turns because the nose appears to rise during entry into these turns.
2—Diving during left turns because the nose appears to rise during entry into these turns.
3—Climbing during left turns because the nose appears to descend during entry into these turns.
4—Climbing during both left and right turns because the nose appears to descend during entry into these turns.

**3378.** The turn-and-slip indicator shown in Figure 20 depicts the reading during a rollout from a medium-banked right turn. It indicates that

1—insufficient right rudder pressure is being applied during the rollout.
2—more rudder pressure is needed during the rollout.
3—more aileron pressure should be applied during the rollout.
4—the same amount of rudder pressure is required to rollout of a turn as to roll into a turn.

Figure 20

**3379.** When turning from base leg to final approach, the type of turn that is most hazardous is a

1—slipping turn.
2—skidding turn.
3—steep, coordinated turn.
4—shallow, slipping turn.

**3380.** During the entry to a right turn, the nose of the aircraft swings slightly to the left before it swings along the horizon to the right. This is a

1—slipping entry, caused by excessive right rudder pressure.
2—skidding entry, caused by excessive right aileron pressure.
3—skidding entry; more right rudder pressure and less right aileron pressure should have been applied.
4—slipping entry; more right rudder pressure should have been applied for the amount of aileron pressure being used.

**3381.** What will cause the nose of an aircraft to move in the direction of the turn before the bank starts in a turn entry?

1—Rudder being applied too late.
2—Aileron being applied too soon.
3—Rudder being applied too soon.
4—Failure to apply back elevator pressure.

**3382.** How should a student be taught to correct for a nose-low attitude during a steep turn?

1—Apply back elevator pressure to attain the desired pitch attitude.
2—Add power to generate more lift.
3—Apply back elevator pressure to attain the desired pitch attitude, then reduce the angle of bank.
4—Reduce the angle of bank, then apply back elevator pressure to attain the desired pitch attitude.

**3383.** While holding a constant angle of bank in a coordinated turn, the displacement of the turn needle will

1—increase as airspeed decreases.
2—indicate the angle of bank.
3—increase as airspeed increases.
4—remain constant regardless of airspeed.

**3384.** What effect, during a constant 30° banked turn, would a reduction in airspeed have on (a) the rate of turn, and (b) the radius of turn?

1—The rate of turn would increase; the radius of turn would increase.
2—The rate of turn would increase; the radius of turn would decrease.
3—The rate of turn would decrease; the radius of turn would increase.
4—The rate of turn would decrease; the radius of turn would decrease.

**3385.** During a level turn, increasing the airspeed while maintaining a constant load factor would result in

1—an increase in the radius of turn.
2—a decrease in radius of turn.
3—the same radius of turn.
4—an increase in centrifugal force.

**3386.** Which is the best technique for minimizing the wing load factor when flying in severe turbulence?

1—Control altitude with power, airspeed with elevator, and accept variations of bank.
2—Control airspeed with power, maintain wings level, and accept variations of altitude.
3—Set power and trim to obtain an airspeed at or below maneuvering speed, maintain wings level, and accept variations of airspeed and altitude.
4—Control airspeed as closely as possible with elevator and power, and accept variations of bank and altitude.

**3387.** To properly compensate for a crosswind during straight–and–level cruising flight, the pilot should

1—fly with the downwing wing higher than the upwind wing.
2—hold aileron pressure toward the wind and hold opposite rudder pressure to prevent a turn.
3—establish a proper heading into the wind by coordinated use of the controls.
4—hold rudder pressure toward the wind.

**3388.** To minimize the side loads placed on the landing gear during touchdown, the pilot should keep the

1—direction of motion of the airplane parallel to the runway.
2—downwind wing lowered sufficiently to eliminate the tendency for the airplane to drift.
3—longitudinal axis of the airplane parallel to the direction of its motion.
4—airplane headed sufficiently into the crosswind so that the direction of motion of the airplane is parallel to the runway.

**3389.** Under normal conditions, a proper crosswind landing on a runway requires that, at the moment of touchdown, the

1—direction of motion of the airplane and its lateral axis be perpendicular to the runway.
2—direction of motion of the airplane and its longitudinal axis be parallel to the runway.
3—upwind wheel should be braked lightly to control the shifting CG.
4—downwind wing be lowered sufficiently to eliminate the tendency for the airplane to drift.

**3390.** During a power approach to a short–field landing, the correct airspeed may be verified by

1—the ability to land on a predetermined spot.
2—the ability to maintain a constant angle of descent.
3—little or no floating during the landing flare.
4—immediate response to control usage.

**3391.** If an emergency situation requires a downwind landing, pilots should expect a faster

1—groundspeed at touchdown, a longer ground roll, and the likelihood of overshooting the desired touchdown point.
2—airspeed at touchdown, a shorter ground roll, and the likelihood of undershooting the desired touchdown point.
3—airspeed at touchdown, a longer ground roll, and better control throughout the landing roll.
4—groundspeed at touchdown, a shorter ground roll, and the likelihood of undershooting the desired touchdown point.

**3392.** On final approach to landing, a faster–than–normal indicated airspeed should be used when

1—landing at airports above 5,000 ft. MSL with above standard temperature conditions.
2—turbulent conditions exist.
3—making a power approach and a full–stall landing.
4—ambient temperatures are above 90° F.

**3393.** If poor aircraft controllability is experienced during an emergency go–around with full flaps, the cause is most probably due to

1—excessive airspeed with full flaps extended.
2—a reduction in the angle of attack with full flaps to the point where aircraft control is greatly impaired.
3—the high–power, low–airspeed situation with the airplane trimmed for a full–flap configuration.
4—ground effect.

**3394.** A go–around from a poor landing approach should

1—generally be preferable to last minute attempts to prevent a bad landing.
2—not be attempted unless circumstances make it absolutely necessary.
3—not be attempted after the landing flare has been initiated regardless of airspeed.
4—not be accomplished if indicated airspeed is less than 25 MPH.

**3395.** During go–arounds from a full–flap approach in conventional airplanes, which procedure should be used if the flight manual does not specify differently?

1—Retract the gear first if heavily loaded; otherwise, retract the flaps first.
2—Start retracting the flaps first, then retract the gear.
3—Retract the gear first since it has a far greater adverse effect on aircraft performance than do flaps.
4—Retract the gear first and adjust flaps only after reaching a safe altitude.

**3396.** One reason a student tends to round–out high during landing is

1—focusing on references that are too close or looking directly down.
2—focusing on references too far ahead.
3—changing focus gradually.
4—looking up during the approach.

**3397.** What normally results from excessive airspeed on final approach?

1—Ballooning.
2—Bouncing.
3—Floating.
4—Hard landing.

**3398.** What normally results from misjudging the rate of sink during a landing?

1—Ballooning.
2—Floating.
3—Ground loop.
4—Poor directional control.

**3399.** What procedure should be used to correct for slight ballooning during landing?

1—Increase angle of attack.
2—Decrease angle of attack.
3—Decrease power.
4—Hold a constant landing attitude.

**3400.** What could be a result of a student focusing too far ahead during a landing approach?

1—Rounding out too high and developing an excessive sink rate.
2—Difficulty in judging the closeness of the ground resulting in a nose–first touchdown.
3—References will become blurred and there will be a tendency to overcontrol.
4—Reactions will be either too abrupt or too late.

**3401.** During an auto launch, the pitch angle of the glider should not exceed

1—10° at 50 ft., 20° at 100 ft., and 45° at 200 ft.
2—15° at 50 ft., 30° at 100 ft., and 45° at 200 ft.
3—15° at 50 ft., 20° at 100 ft., and 40° at 200 ft.
4—20° at 50 ft., 30° at 100 ft., and 45° at 200 ft.

**3402.** At what point during an auto tow should the glider pilot establish the maximum pitch attitude for the climb?

1—200 ft. above the ground.
2—Immediately after takeoff.
3—100 ft. above the ground.
4—Between 300 and 400 ft. above the ground.

**3403.** If the tow releases fail to function on both the glider and towplane, the glider pilot should plan to land in which manner?

1—Fly the final approach in low–tow position and land before the towplane, but use no spoilers or brakes during the landing roll until after the towplane touches down.
2—Fly the final approach in high–tow position and extend the spoilers just prior to the towplane's touchdown.
3—Fly the final approach to the side of the towplane's flightpath and extend the spoilers when the towplane is approximately 5 ft. above the ground.
4—Fly the final approach in low–tow position and land before the towplane, applying spoilers or brakes before the towplane touches down.

**3404.** What consideration should be given in the choice of a towplane for use in aero tows?

1—Towplane's low–wing loading and low–power loading.
2—L/D of the glider to be towed.
3—Gross weight of the glider to be towed.
4—Stall speed of the towplane.

**3405.** Both lift and drag would be increased when which of these devices are extended?

1—Flaps.
2—Spoilers.
3—Dive brakes.
4—Slots.

**3406.** The reason for retaining water ballast while thermals are strong and dumping the water when thermals weaken is to

1—increase the rate of descent.
2—decrease the rate of descent.
3—decrease forward speed.
4—increase forward speed.

**3407.** What is the proper speed to fly when passing through lift with no intention to work the lift?

1—Maximum safe speed.
2—Minimum control speed.
3—Best L/D speed.
4—Minimum sink speed.

**3408.** When flying into a strong headwind on a long glide back to the airport, the recommended speed to use is the

1—minimum sink speed.
2—best L/D speed plus half the estimated windspeed at the glider's flight altitude.
3—airspeed which produces the flattest glide angle for the convective condition regardless of the wind.
4—best glide speed.

**3409.** With regard to two or more gliders flying in the same thermal, which statement is true?

1—All turns should be to the right.
2—Turns should be in the same direction as the highest glider.
3—Low-performance gliders have the right-of-way over high-performance gliders.
4—Turns should be made in the same direction as the first glider to enter the thermal.

**3410.** Which statement is true relating to the direction in which turns should be made during slope soaring?

1—All turns should be made downwind toward the slope.
2—The upwind turn should be made to the left; the downwind turn should be made to the right.
3—All reversing turns should be made to the left.
4—All reversing turns should be made into the wind away from the slope.

**3411.** A rule of thumb for flying a final approach is to maintain a speed that is

1—twice the glider's stall speed plus half the estimated windspeed.
2—50 percent above the glider's stall speed plus half the estimated windspeed.
3—twice the glider's stall speed, regardless of windspeed.
4—50 percent above the glider's stall speed, regardless of windspeed.

**3412.** Unless adequate speed control is maintained during the turn to base and the final approach for a landing into the wind, which would most likely occur if a steep wind gradient existed?

1—The desired landing spot would be undershot or the glider would stall.
2—The airspeed on final approach would increase, causing the glider to overshoot the desired landing spot.
3—The wingtip on the outside of the turn would stall before the wingtip on the inside of the turn.
4—The glider would tend to roll out of the turn.

**3413.** If swirling dust, leaves, or debris indicates a strong thermal on the final approach to a landing, it is recommended that the glider pilot

1—reduce the airspeed to the minimum sink speed.
2—open the spoilers and reduce the airspeed.
3—close the spoilers and increase the airspeed.
4—open the spoilers and maintain a constant airspeed.

**3414.** When making an off-field landing, it is recommended that the landing be accomplished

1—uphill, if possible, regardless of the wind direction.
2—at as fast a speed as possible when the field has tall grass or crops.
3—in cultivated fields where the crops have not yet been harvested.
4—in pastures which are seldom cultivated.

**3415.** Which would most likely ensure a safe off-field landing?

1—Positioning the approach pattern and turning points in accordance with the altimeter indications.
2—Landing in a pasture or noncultivated field rather than one in cultivation and whose crops have been harvested.
3—Landing into the wind, regardless of the type or slope of the terrain.
4—Maintaining an approach airspeed of at least 20 percent above the glider's stall speed.

**3416.** Select the true statement concerning gyroplane taxi procedures.

1—The cyclic stick should be held in the neutral position at all times.
2—Avoid abrupt control movements when blades are turning.
3—The cyclic stick should be held slightly aft of neutral at all times.
4—Taxi on rough terrain at a slightly higher speed when the rotor blades are turning.

**3417.** To taxi on the surface in a safe and efficient manner, helicopter pilots should use the

1—collective pitch to control starting, taxi speed, and stopping.
2—anti-torque pedals to correct for drift during crosswind conditions.
3—cyclic pitch to control starting, taxi speed, and stopping.
4—cyclic pitch to maintain heading during crosswind conditions.

**3418.** To taxi on the surface in a safe efficient manner, one should use the cyclic pitch to

1—control taxi speed.
2—start and stop aircraft movement.
3—correct for drift during crosswind conditions.
4—maintain heading during crosswind conditions.

**3419.** During a climbing turn, the engine RPM is at the desired setting, but the manifold pressure is higher than desired. To maintain the desired engine RPM and correct the manifold pressure, what initial control action should be taken?

1—Decrease the collective pitch and decrease the throttle.
2—Decrease the collective pitch only.
3—Decrease the collective pitch and increase the throttle.
4—Decrease the throttle only.

**3420.** If excessive right pedal is applied during an autorotative turn to the right, the nose of the helicopter will tend to

1—pitch down and the rotor RPM will tend to increase.
2—pitch up and the rotor RPM will tend to decrease.
3—pitch down and the rotor RPM will tend to decrease.
4—pitch up and the rotor RPM will tend to increase.

**3421.** Using right pedal to assist a right turn during an autorotative descent will probably result in what actions?

1—Pitch-up of the nose, increase in rotor RPM, decrease in sink rate, and decrease in indicated airspeed.
2—Pitch-up of the nose, decrease in rotor RPM, increase in sink rate, and increase in indicated airspeed.
3—Pitch-down of the nose, increase in rotor RPM, increase in sink rate, and decrease in indicated airspeed.
4—Pitch-down of the nose, decrease in the rotor RPM, increase in sink rate, and increase in indicated airspeed.

**3422.** Choose the most correct statement pertaining to slips and skids during helicopter flight.

1—In a right descending turn, if insufficient right pedal is applied to compensate for the decreased torque effect, a slip will result.
2—A skid occurs when the rate of turn is too slow for the amount of bank being used.
3—In a left climbing turn, if insufficient right rudder is applied to compensate for the increased torque effect, a slip will result.
4—A skid occurs when too much rudder is applied in the direction opposite the turn.

**3423.** Immediately after takeoff, a downwind turn close to the ground is not good practice because it

1—increases the hazards involved should an emergency landing become necessary.
2—causes an increase in the speed at which rotor stall occurs.
3—usually produces excessive flapping in the rotor blades.
4—decreases the rate of climb significantly.

**3424.** After attaining effective translational lift during a normal takeoff, additional forward cyclic is required as the airspeed increases. Why is this action required?

1—To counteract the increase in lift which would result in the nose rising.
2—To counteract the dissymmetry of lift which causes the helicopter to roll to the left.
3—To counteract the adverse effects of pendular action.
4—To counteract gyroscopic precession.

**3425.** The collective pitch control should be used to

A. correct for loss of lift during level turns at altitude.
B. maintain desired engine power.
C. correct a high rotor RPM during autorotations from altitude.

The correct statement(s) is/are

1—A only.
2—A and B only.
3—A, B, and C.
4—B only.

**3426.** The antitorque pedals should be used to

A. maintain heading during cruise flight.
B. correct for loss of torque during autorotations.
C. maintain heading during crosswind takeoffs and approaches.

The correct statement(s) is/are

1—A only.
2—B and C only.
3—A and C only.
4—A, B, and C.

**3427.** During an autorotative descent, using left pedal to assist a left turn will probably cause the rotor RPM to

1—decrease; the aircraft nose will pitch down.
2—decrease; the aircraft nose will pitch up.
3—increase; the airspeed will decrease.
4—increase; the aircraft nose will pitch down.

**3428.** During the full-flare portion of a power-off landing, the rotor RPM tends to

1—increase initially.
2—decrease initially.
3—remain constant.
4—decrease during high density altitude days, and increase during low density altitude days.

**3429.** During a normal approach to a hover, the cyclic pitch control is used primarily to

1—control rate of closure.
2—maintain heading.
3—control angle of descent.
4—prevent loss of translational lift.

**3430.** Which statement best describes the function of the controls during a powered approach to hover?

1—Cyclic pitch primarily controls rate of descent; collective pitch primarily controls angle of descent and groundspeed.
2—Collective pitch primarily controls angle of descent; rotor RPM primarily controls rate of descent; cyclic pitch primarily controls groundspeed.
3—Collective pitch primarily controls angle of descent; cyclic pitch primarily controls groundspeed.
4—Cyclic pitch primarily controls angle of descent and groundspeed; collective pitch primarily controls rate of descent.

**3431.** On a power–off final approach, a pilot establishes a glide attitude which is too flat. The proper recovery procedure for the subsequent high rate of descent is to

1—initiate the landing flare earlier and complete it at a slower than normal rate in order to hold G force to a minimum.
2—increase power, and if altitude permits, lower the nose.
3—lower the nose immediately, but do not increase the power since this will again raise the nose.
4—increase rotor lift by applying aft cyclic pressure.

**3432.** When autorotating during high density altitude or strong gusty wind conditions, a slightly higher–than–normal airspeed is recommended because the

1—resulting glide angle will approximate that of a slightly reduced airspeed under conditions of light loads, low density altitude, or calm wind.
2—higher rotor speed will result in an extended glide.
3—lower rotor speed will cause the rate of descent to approximate that of a slightly increased rotor speed under conditions of light loads, low density altitude, or calm wind.
4—resulting slower rate of descent will allow more time for the pilot to estimate the touchdown point.

**3433.** During a flare autorotative descent and landing, additional right pedal is required to maintain heading after initial collective pitch is applied. This action is necessary because of

1—the Coriolis effect of the main rotor blades during autorotation.
2—translating tendency of helicopters during autorotation.
3—gyroscopic precession.
4—the reduction in rotor RPM.

**3434.** Which statement is true concerning a gyroplane?

1—A gyroplane can take off from any area in which it can safely land.
2—Rotor RPM will remain constant during changes in airspeed while descending.
3—A gyroplane is capable of getting into a settling–with–power situation much the same way as a helicopter.
4—A gyroplane can safely descend vertically or move backward with respect to ground references during a descent if altitude permits.

**3435.** Of the following situations, which would require the highest power setting to hover?

1—Headed downwind in moderate windspeeds.
2—Over tall grass in moderate windspeeds.
3—Headed crosswind in moderate windspeeds.
4—Over tall grass in zero wind conditions.

**3436.** The anti–torque system fails during cruising flight and a powered approach landing is commenced. If the helicopter yaws to the right just prior to touchdown, what could the pilot do to help swing the nose to the left?

1—Decrease airspeed.
2—Increase collective pitch.
3—Increase the throttle.
4—Decrease the throttle.

**3437.** What corrective action should be taken if the anti–torque system should fail while at a hover?

1—Apply left pedal as necessary to stop the torque–induced turn to the right.
2—Lower the collective pitch to reduce the load on the main rotor blades.
3—Turn the magnetos to the OFF position to stop the torque–induced turn to the right.
4—Close the throttle and autorotate.

**3438.** In the event a running landing is performed during crosswind conditions, proper landing technique requires that the

1—longitudinal axis of the gyroplane be parallel to the runway.
2—upwind wheel should be braked lightly to control the tendency of the crosswind to shift the CG.
3—lateral axis of the gyroplane be parallel to the gyroplane's direction of motion.
4—direction of gyroplane motion and heading coincide with runway direction.

**3439.** A running or roll–on landing in a gyroplane should be considered

1—an unsafe maneuver except in calm or light wind conditions.
2—a normal and acceptable maneuver if proper conditions relating to landing surface and groundspeed exist.
3—only in the event of an engine failure.
4—an unsafe maneuver if the airspeed is less than 45 MPH.

**3440.** Which statement is true concerning a running takeoff?

1—It requires less power than would be required to take off from a hover with the same load.
2—If the helicopter cannot be raised off the ground at all, this type of takeoff should be accomplished.
3—The chief advantage of this type of takeoff is that the additional speed can quickly be converted to altitude.
4—Normal climb speed should be attained between 10 to 20 feet of altitude.

**3441.** During a running takeoff in a crosswind, which describes proper control technique?

1—Cyclic stick controls both heading and direction of movement.
2—Heading is maintained with pedals; direction of movement (groundpath or track) is maintained with cyclic.
3—Heading is maintained with cyclic; direction of movement (groundpath or track) is maintained with pedals.
4—Pedals control both heading and direction of movement.

**3442.** How should the rotor RPM be controlled during a running landing?

1—Normal operating RPM should be maintained until the helicopter stops, primarily to ensure adequate directional control.
2—Normal operating RPM should be maintained during the landing roll or skid, primarily to ensure that sufficient lift is available should an emergency develop.
3—The rotor RPM should be permitted to decrease slowly, once the helicopter is on the ground, to allow the full weight of the helicopter to settle on the skids.
4—Once the helicopter is on the ground it is not necessary to maintain normal operating RPM.

**3443.** When making a slope landing, the cyclic pitch control should be used to

1—place the rotor disc parallel to the slope.
2—hold the upslope skid against the slope.
3—lower the downslope skid to the ground.
4—maintain heading throughout the maneuver.

**3444.** The steepness of the slope on which a helicopter with skid-type landing gear can land is most dependent on

1—the position of the CG.
2—the amount of lateral cyclic stick travel available.
3—its gross weight.
4—the density altitude.

**3445.** As the upslope skid touches the ground during a slope landing, the

1—cyclic pitch control should remain stationary to keep the aircraft from moving.
2—anti-torque pedals should remain stationary so the heading will not vary.
3—collective pitch control should be used to lower the downslope skid to the ground.
4—collective pitch should remain stationary and the cyclic pitch control should be used to lower the downslope skid to the ground.

**3446.** What type approach should be made to a rooftop heliport under conditions of relatively high wind and turbulence?

1—A normal approach.
2—A steeper-than-normal approach.
3—A shallower-than-normal approach.
4—A shallow approach, with higher-than-normal airspeed.

**3447.** At the onset of blade stall vibration, which corrective measures should the pilot take?

1—Reduce collective pitch, increase rotor RPM, and increase forward airspeed.
2—Increase collective pitch, increase rotor RPM, and reduce forward airspeed.
3—Reduce collective pitch, decrease rotor RPM, and reduce forward airspeed.
4—Reduce collective pitch, increase rotor RPM, and reduce forward airspeed.

**3448.** The major indications of an incipient retreating blade stall situation, in order of occurrence, are what?

1—Slow pitchup of the nose, high-frequency vibration, and a tendency for the helicopter to roll.
2—Low-frequency vibration, pitchup of the nose, and a tendency for the helicopter to roll.
3—Slow pitchup of the nose, tendency for the helicopter to roll, followed by a medium-frequency vibration.
4—High-frequency vibration, pitchdown of the nose, and a tendency for the helicopter to roll.

**3449.** When operating at high forward airspeed, retreating blade stall is more likely to occur under conditions of

1—high gross weight, low RPM, and turbulent air.
2—high gross weight, high RPM, and smooth air.
3—low gross weight, low RPM, and low-density altitude.
4—low gross weight, high RPM, and high-density altitude.

**3450.** If complete power failure occurs while at cruising altitude, the collective pitch should be lowered to the bottom position immediately to

1—uncouple the main rotor system from the engine.
2—produce a downward flow of air through the rotor system.
3—reduce the pitch on all main rotor blades so that proper rotor RPM can be maintained.
4—engage the free-wheeling unit so that proper rotor RPM can be maintained.

**3451.** What suggestion could you make to students who are experiencing motion sickness?

1—Recommend taking medication to prevent motion sickness.
2—Tell the students to avoid unnecessary head movement and to keep their eyes on a point outside the aircraft.
3—Have the students lower their head, shut their eyes, and take deep breaths.
4—Suggest that the flight be continued because this will help build up resistance.

**3452.** Motion sickness is caused by

1—a chemical imbalance in the body.
2—continued stimulation of the tiny portion of the inner ear which controls sense of balance.
3—an instability in the brain cells which affects balance and will generally be overcome with experience.
4—the movement of an aircraft causing the stomach to create an acid substance which causes the stomach lining to contract.

**3453.** One aid in increasing night vision effectivenss would be to

1—avoid concentrating on trying to see objects.
2—move the eyes more rapidly than in daylight.
3—look directly at objects.
4—force the eyes to view off center.

**3454.** Why should the integrated method of flight instruction be used during student training?

1—It fully preapres the student for flight in instrument weather conditions.
2—It develops proper habit patterns of instrument interpretation and aircraft control.
3—It encourages students to concentrate on flying by reference to instruments.
4—It prevents the formation of firm habit patterns.

**3455.** A high degree of aircraft control is required to ensure safe flight. Select the instructing technique that is recommended to help a student develop this skill.

1—Use of different type of aircraft during training flight.
2—Use of distractions during training flight.
3—Scheduling the student with several different instructors during flight training.
4—Demonstrating each new maneuver several times before permitting student practice.

**3456.** During training flights, an instructor should interject distractors to determine if the student can

1—be easily discouraged.
2—learn despite stressful conditions.
3—recover promptly from an accidental stall/spin.
4—maintain aircraft control while his/her attention is diverted.

**3457.** During S-turn practice, an acceptable example of interjecting a distracting situation is to request the student to

1—identify certain objects on the ground.
2—close his/her eyes during course reversal.
3—fly at minimum controllable airspeed.
4—change airspeed during course reversal.

**3458.** When beginning a rectangular course, the determining factor in deciding the distance from the field boundary at which an aircraft should be flown is the

1—steepness of the bank desired in the turns.
2—size of the rectangular area chosen.
3—windspeed.
4—type of aircraft being used.

**3459.** In flying the rectangular course illustrated in Figure 21, when would the aircraft be turned less than 90°?

1—Corners 1 and 4.
2—Corners 2 and 3.
3—Corners 1 and 2.
4—Corners 2 and 4.

**3460.** In flying the rectangular course illustrated in Figure 21, when would the aircraft be turned more than 90°?

1—Corners 1 and 3.
2—Corners 2 and 3.
3—Corners 1 and 3.
4—Corners 2 and 4.

**3461.** In flying the rectangular course illustrated in Figure 21, when should the aircraft bank vary from a steep bank to a medium bank?

1—Corners 2 and 3.
2—Corner 1.
3—Corner 2.
4—Corner 3.

**3462.** In flying the rectangular course illustrated in Figure 21, which would describe the proper angle of bank?

1—Corner 1 ste to medium, corner 2 medium to shallow, corner 3 shallow to medium and corner 4 medium to steep.
2—Corner 1 shallow, corner 2 medium, corner 3 steep, and corner 4 shallow.
3—Corner 1 shallow to medium, corner 2 medium to steep, corner 3 steep to medium, and corner 4 medium to shallow.
4—Corner 1 shallow, corner 2 medium to steep, corner 3 steep, and corner 4 medium to shallow.

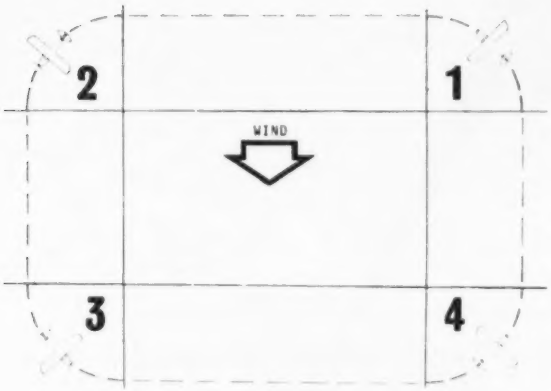



Figure 21

**3463.** Figure 22 is a ground track for a turn around a point. The wing (lateral axis) will be in alignment with the pylon at which of the lettered positions?

1—D only.
2—B and D.
3—A and C.
4—A, B, C, and D.

**3464.** If you instruct a student to practice turns around a point using a bank that is not to exceed 45° at its steepest point, it would be best to start at which of the lettered positions shown in Figure 22?

1—A or D.
2—B or D.
3—A only.
4—B or C.

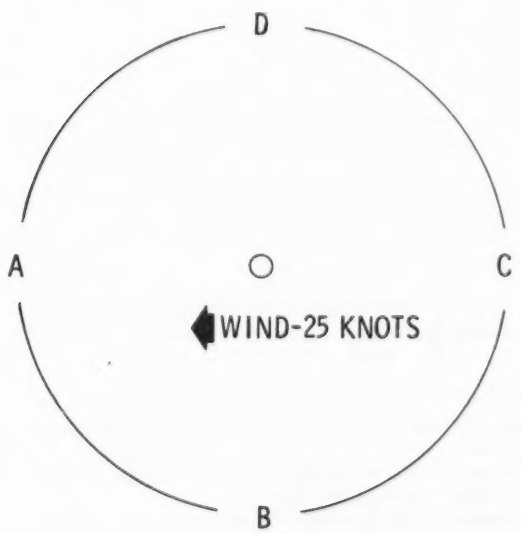



Figure 22

**3465.** Referring to Figure 23, the groundspeed will be equal in which of the following pairs of positions?

1—1 and 5, 2 and 4, 6 and 8.
2—1 and 5, 2 and 8, 4 and 6.
3—1 and 5, 2 and 6, 4 and 8.
4—1 and 5 only.

**3466.** Refer to Figure 23. The angle of bank will be most nearly equal in which pair of positions?

1—3 and 7.
2—1 and 5.
3—4 and 8.
4—4 and 6.

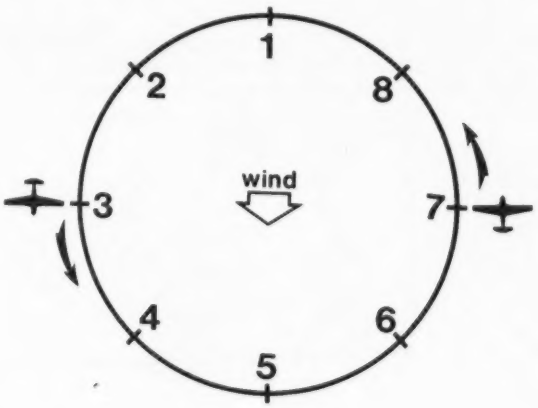



Figure 23

**3467.** Refer to Figure 24. With the wind as shown and the bank constant throughout the turn, which of the ground tracks illustrated would be most probable?

1—A.
2—B.
3—C.
4—D.

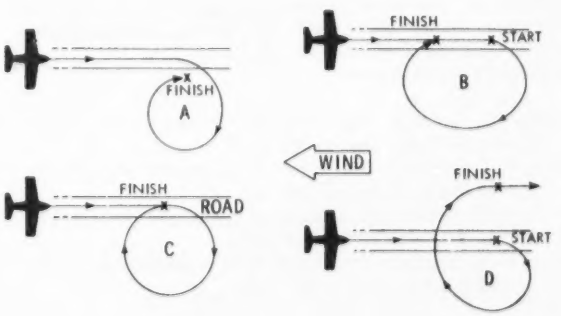



Figure 24

**3468.** Refer to Figure 25. In which of the following pairs of positions will the groundspeeds be equal?

1—A and F, B and E only.
2—A and F, B and E, C and D.
3—B and E only.
4—A and B, D and E, E and F.

**3469.** The angle of bank should vary throughout the turn if proper ground track is to be maintained during S-turn practice. Which positions, as depicted in Figure 25, require the steeper angle of bank?

1—C and D.
2—B and E.
3—D and E.
4—A and F.

**3470.** Refer to Figure 25. Proper execution of S-turns across a road requires that the aircraft be crabbed into the wind the greatest amounts at which of the following points?

1—A and D.
2—C and D.
3—A and F.
4—B and E.

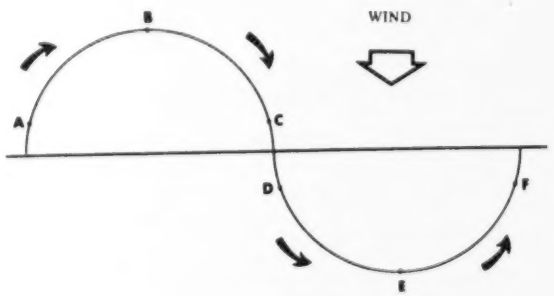



Figure 25

**3471.** While practicing S turns (see Figure 26), a consistently smaller half-circle is made on one side of the road than on the other, and this turn is not completed before crossing the road or reference line. This would most likely occur in turn

1—X-Y-Z because the bank is increased too slowly during the latter part of the turn.
2—X-Y-Z because the bank is increased too rapidly during the early part of the turn.
3—U-V-W because the bank is decreased too rapidly during the latter part of the turn.
4—U-V-W because the bank is increased too slowly during the early part of the turn.

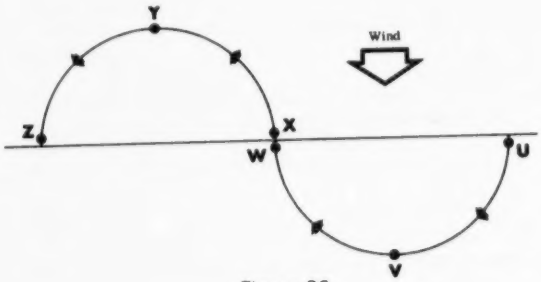



Figure 26

**3472.** In Figure 27 which most nearly depicts the ground track in relation to the pylons when performing eights-on-pylons during a strong wind?

1—A.
2—B.
3—C.
4—D.

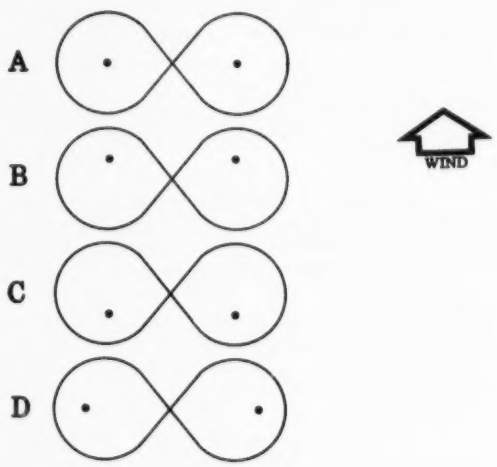



Figure 27

**3473.** In properly coordinated eights-on-pylons, if the reference point is behind the pylon it means the

1—airplane is above the pivotal altitude.
2—airplane is below the pivotal altitude.
3—angle of bank is too shallow.
4—airspeed is too fast.

**3474.** While performing eights-on-pylons, the turn-and-slip indicator appears as shown in Figure 28. The pilot must

1—decrease the bank to hold the reference point on the pylon without slipping because the radius of turn is too small.
2—increase altitude to obtain the correct pivotal altitude, and correct the skidding turn.
3—decrease altitude to obtain the correct pivotal altitude, and correct the slipping turn.
4—decrease the bank to turn back the wing, which has crept ahead of the pylon.

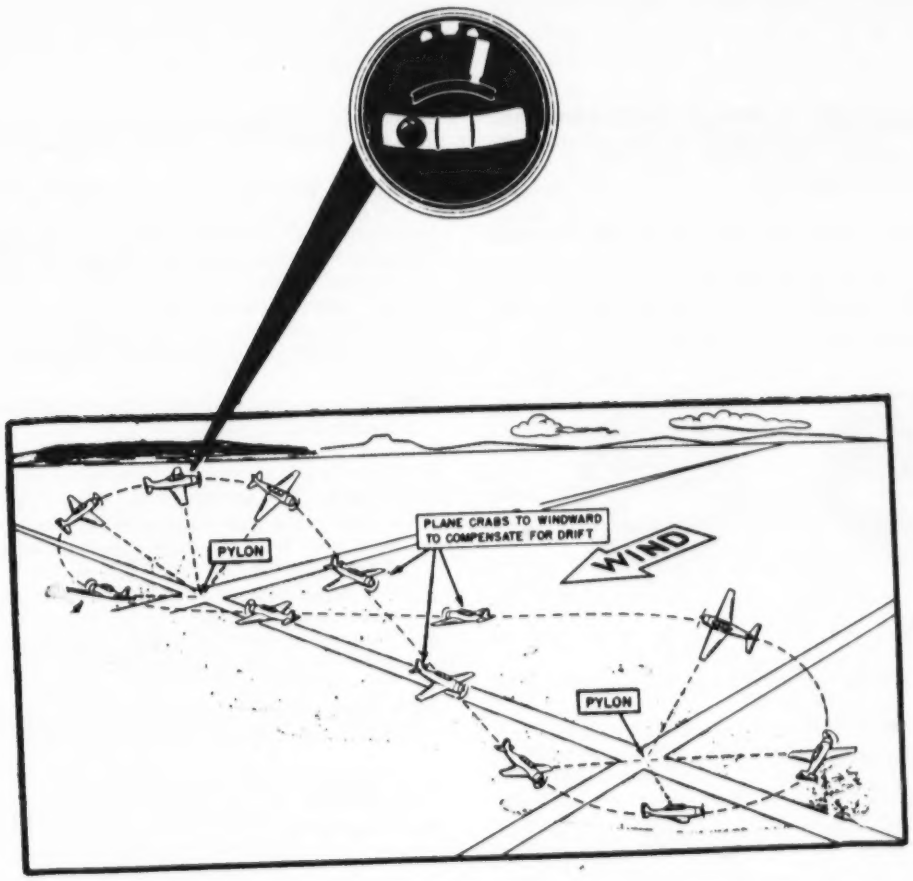



Figure 28

**3475.** At which of the lettered positions shown in Figure 29 would the bank be steepest when correctly practicing eights-on-pylons?

1—A.
2—B.
3—C.
4—D.

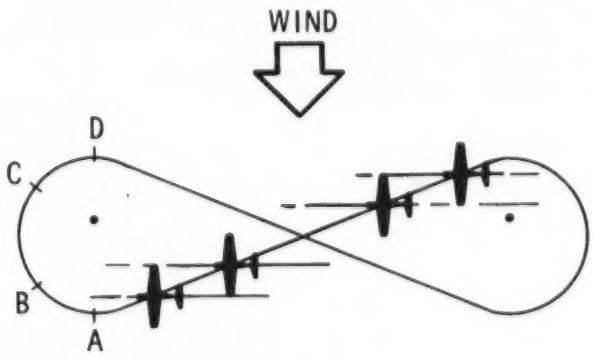



Figure 29

**3476.** The pivotal altitude for eights-on-pylons is dependent primarily upon the

1—true airspeed.
2—groundspeed.
3—distance from the pylon.
4—degree of bank.

**3477.** If the wing moves behind the pylon during properly coordinated eights-on-pylons, the airplane is

1—below pivotal altitude.
2—above pivotal altitude.
3—too close to the pylon.
4—flying too fast.

**3478.** Misuse of rudder in attempting to hold the pylon during the performance of eights-on-pylons will generally result in the turn-and-slip indicator appearing as shown in which position of Figure 30?

1—"A" if below pivotal altitude; "B" if above pivotal altitude.
2—"A" if above or below pivotal altitude.
3—"A" if above pivotal altitude; "B" if below pivotal altitude.
4—"B" if above or below pivotal altitude.

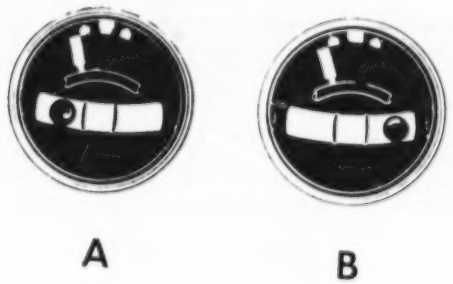



Figure 30

**3479.** The objective of a cross-control stall demonstration is to

1—emphasize the hazard of an excessive slip during a landing approach.
2—teach the proper recovery technique should this type of stall occur during final approach.
3—show the effect of improper control technique and emphasize the importance of coordinated control when making turns.
4—show the result of using too steep an angle of bank when making turns close to the ground.

**3480.** Two distinct flight situations should be covered when teaching slow flight. These are the establishment and maintenance of

1—a speed at which the airplane is operating on the back side of the power curve, and a speed at which the elevator control can be held full-back with no further loss of control.
2—airspeeds appropriate for landing approaches, and flight at minimum controllable speeds.
3—maneuvering speed, and the best rate-of-climb or best angle-of-climb speeds.
4—an airspeed which gives a stall warning indication, and a speed at which complete recovery can be made from stalls.

**3481.** The primary purpose of practicing operations at minimum controllable airspeeds is to enable students to

1—develop proficiency at anticipating the onset of power-on stalls.
2—safely fly airport traffic patterns at various airspeeds.
3—become familiar with appropriate control techniques for such speeds, and the rapidity with which control effectiveness can be lost.
4—quickly develop the skills required for effective directional control during the takeoff run.

**3482.** If an accelerated stall occurs in a steep turn, how will the airplane respond?

1—Both wings are flying at the same angle of attack; therefore, they will stall at the same time.
2—In a slip, the high wing stalls first; in a skid, the low wing stalls first; in coordinated flight, both wings stall at the same time.
3—The inside wing stalls first because it is flying at a higher angle of attack.
4—The outside wing stalls first because it is flying at a higher angle of attack.

**3483.** If an accelerated stall occurs during a steep turn, in which direction would the airplane tend to roll?

1—Toward the inside of the turn.
2—Toward the outside of the turn.
3—In neither direction. The nose will pitch away from the pilot as it does when a stall occurs in straight flight.
4—The direction of roll depends on whether the airplane is slipping, skidding, or in coordinated flight.

**3484.** Students should be taught that throughout a level, 720° power turn to the right, the rudder is normally used to

1—prevent yawing.
2—control the rate of turn.
3—hold the airplane in the turn once it is established.
4—maintain a constant altitude.

**3485.** Pilots who initiate a chandelle with a bank that is too steep will most likely

1—turn more than 180° before completing the roll-out.
2—perform a comparatively level steep turn with a nose-high roll-out at the 180° point.
3—complete the maneuver before turning 180°.
4—stall before completing the maneuver.

**3486.** What may occur if the initial bank is too shallow when performing a chandelle?

1—Stalling the aircraft before reaching the 180° point.
2—Completing the maneuver with excessive airspeed.
3—All turn and little climb.
4—Completing the maneuver with too low a pitch attitude.

**3487.** When performing a chandelle where should maximum pitch occur?

1—30° point.
2—45° point.
3—90° point.
4—180° point.

**3488.** Which best describes pitch and bank during the first 90° of a chandelle?

1—Constant pitch and changing bank.
2—Constant pitch and bank.
3—Constant bank and changing pitch.
4—Changing pitch and bank.

**3489.** Which best describes the pitch and bank during the second 90° of a chandelle?

1—Constant pitch and changing bank.
2—Constant pitch and bank.
3—Constant bank and changing pitch.
4—Changing pitch and bank.

**3490.** When performing a lazy eight, where should the maximum pitch–up attitude occur?

1—45° point.
2—90° point.
3—135° point.
4—180° point.

**3491.** When performing a lazy eight, when should the aircraft be at minimum airspeed?

1—45° point.
2—90° point.
3—135° point.
4—180° point.

**3492.** When performing a lazy eight, where should the maximum pitch–down attitude occur?

1—45° point.
2—90° point.
3—135° point.
4—180° point.

**3493.** When performing a lazy eight, when should the maximum altitude occur?

1—45° point.
2—90° point.
3—135° point.
4—180° point.

**3494.** When performing a lazy eight, when should the altitude be the same as the entry altitude?

1—45° point.
2—90° point.
3—135° point.
4—180° point.

**3495.** What should occur at the 90° point of a lazy eight?

1—Airspeed and altitude should be the same as at entry.
2—Maximum pitch attitude, minimum airspeed, and minimum bank.
3—Maximum pitch–down attitude, steepest bank, and highest airspeed.
4—Steepest bank, minimum airspeed, maximum altitude, and level pitch attitude.

**3496.** What would cause the 45° point to be reached before the maximum pitch–up attitude during a lazy eight?

1—Beginning with too slow a rate of roll.
2—Beginning with too rapid a rate of roll.
3—Allowing the airspeed to remain too high causing the rate of turn to increase.
4—Not using adequate rudder pressure in the direction of the turn.

**3497.** During practice of lazy eights, the most probable cause of the uncoordinated situation at the completion of 90° of turn (indicated by the turn-and-slip indicator shown in Figure 31) is the

1—failure to constantly adjust control pressures for torque and airspeed.
2—use of too much right rudder control pressure.
3—application of cross-control pressures.
4—use of too much left aileron control pressure.

**3498.** Of the following, which is the most probable result if a pilot initiates the climbing turn portions of the lazy eight with banks that are too steep?

1—Attaining a pitch attitude that is too steep and stalling at the top of the climbing turn.
2—Completing each 180° change of direction with a net gain of altitude.
3—Turning at a rate too fast for the rate of climb and therefore, completing each 180° change of direction with excessive airspeed.
4—Overcompensating by turning at a rate too slow for the rate of climb.

**3499.** At what point, if ever, in a lazy eight is it most likely that it will be necessary to exert opposing aileron and rudder pressures in order to maintain coordinated flight?

1—It should never be necessary.
2—At the point of slowest speed.
3—At the point of fastest speed.
4—At the point of lowest pitch attitude.

**3500.** Which statement pertaining to rapid decelerations (quick-stops) is most accurate?

1—The nose of the helicopter will normally tend to yaw to the right during the entry and tend to yaw to the left during the completion of the maneuver.
2—The primary purpose of this maneuver is to lose effective translational lift.
3—The rotor RPM will normally tend to increase during the entry and tend to decrease during the completion of the maneuver.
4—As collective pitch is lowered during the recovery, left pedal should be applied to maintain the heading.

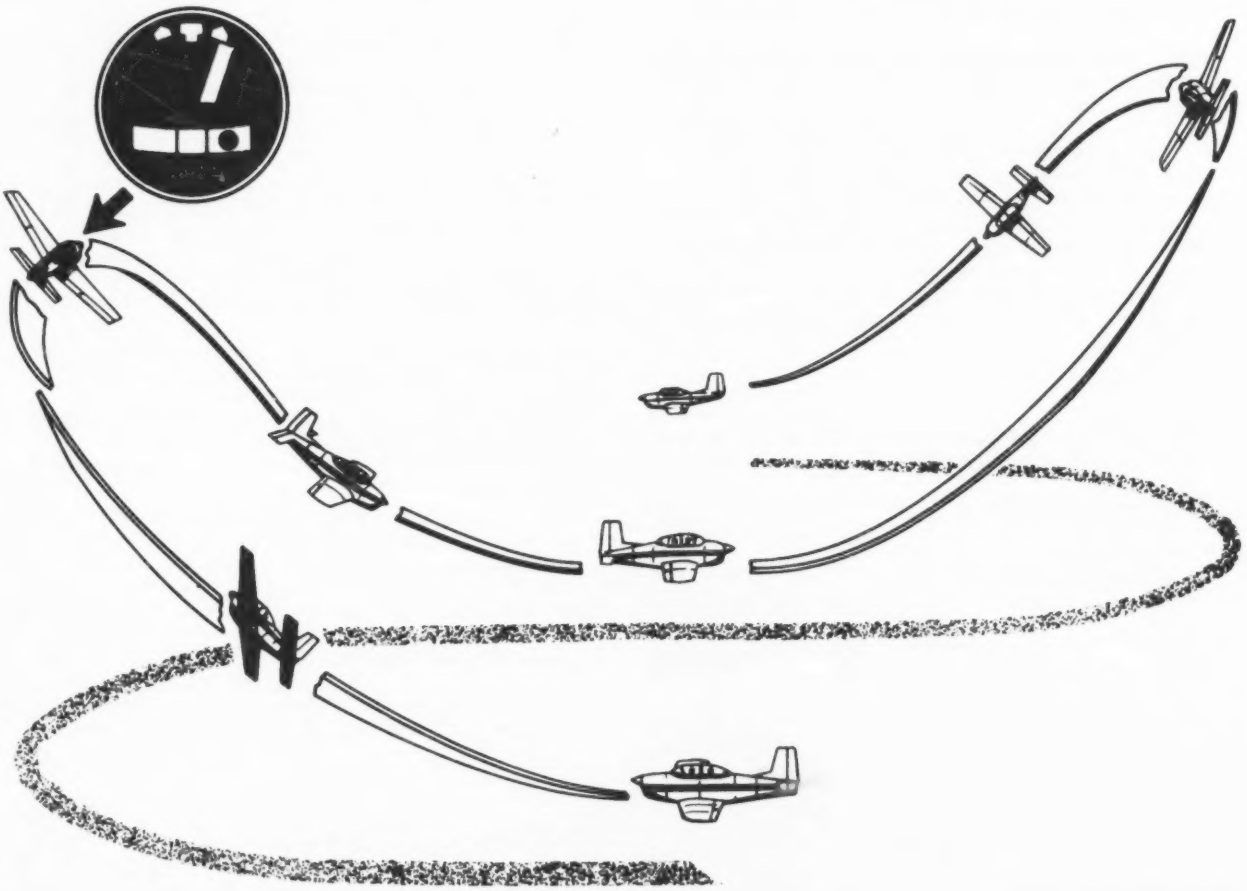


Figure 31

**3501.** Dual instruction and solo practice on quick stops should usually be accomplished headed upwind

1—between 100 ft. and 200 ft. above the surface.
2—and only during low density altitude conditions.
3—at least 500 ft. above the surface.
4—at an altitude that will permit a safe clearance between the tail rotor and the ground throughout the maneuver.

**3502.** Recovery from settling with power should be initiated by

1—increasing forward airspeed and/or partially lowering the collective pitch.
2—increasing forward airspeed and/or partially raising the collective pitch.
3—decreasing forward airspeed and/or partially raising the collective pitch.
4—entering autorotation.

**3503.** Under which situation is a helicopter most likely to enter the condition known as settling with power?

1—While maintaining forward cruising airspeed with a rate of descent in excess of 300 ft./min.
2—While maintaining a forward airspeed of less than 10 MPH with a rate of descent in excess of 300 ft./min.
3—While hovering in ground effect.
4—While maintaining altitude and a forward airspeed of less than 10 MPH.

**3504.** Which method of instruction would be an acceptable way to instill and sustain the habit of vigilance during maneuvering an aircraft?

1—Terminate the flight lesson immediately if a student fails to properly use clearing procedures.
2—Prior to any maneuver have the student verbalize clearing procedures (call out "clear" left, right, above or below).
3—Reprimand the student in a forceful manner.
4—Immediately take control of the aircraft if a student fails to execute a clearing procedure prior to a maneuver.

**3505.** What is an effective way to prevent a collision hazard in the traffic pattern?

1—Enter the pattern in a descent.
2—Maintain the proper traffic pattern altitude and continually scan the area.
3—Rely on radio reports from other aircraft who may be operating in the traffic pattern.
4—Execute S turns during the entire traffic pattern to assist in scanning.

**3506.** Which technique should a student be taught to scan for traffic to the right and left during straight and level flight?

1—Systematically focus on different segments of the sky for short intervals.
2—Concentrate on relative movement detected in the peripheral vision area.
3—Continuous sweeping of the windshield from right to left.
4—Concentrate on traffic ahead and to the right because traffic to the left must give right of way.

**3507.** What effect does haze have on the ability to see traffic or terrain features during flight?

1—Haze causes the eyes to focus at infinity.
2—The eyes tend to overwork in haze and do not detect relative movement easily.
3—Contrasting colors become less distinct making objects more difficult to see.
4—All traffic or terrain features appear to be farther away than their actual distance.

## APPENDIX 2

## ABBREVIATIONS

The abbreviations listed below are used to identify the aircraft category/class associated with each test question listed in Appendix 1.

### AIRCRAFT ABBREVIATIONS

ALL — All
AIR — Airplane
GLI — Glider
GYR — Gyroplane
HLC — Helicopter
RTC — Rotorcraft*

*RTC applies to both gyroplane and helicopter.

## GOVERNMENT PUBLICATIONS

The following is a list of government publications which should be useful when preparing for the written examinations contained in this book:

Airman's Information Manual
Federal Aviation Regulations
AC 00-6, Aviation Weather
AC 00-45, Aviation Weather Services
AC 00-50, Low Level Wind Shear
AC 60-14, Aviation Instructors Handbook
AC 61-13, Basic Helicopter Handbook
AC 61-21, Flight Training Handbook
AC 61-23, Pilot's Handbook of Aeronautical Knowledge
AC 61-27, Instrument Flying Handbook
AC 61-92, Use of Distractions During Pilot Certification Flight Test
AC 67-2, Medical Handbook for Pilots
AC 90-48, Pilot's Role in Collision Avoidance
AC 91-23, Pilot's Weight and Balance Handbook

AC 00-2, Advisory Circular Checklist, explains how to obtain the above mentioned advisory circulars. You may request to be placed on the mailing list from the following office:

U.S. Department of Transportation
Distribution Requirements Section, M-494.1
Washington, D.C. 20590

FAA-APA-PG-7, Guide to Federal Aviation Administration Publications, is another useful phamplet containing all FAA publications and may be ordered from the following office:

Administration Publications
U.S. Department of Transportation
Subsequent Distribution Unit, M-494.3
Washington, D.C. 20590

Other sources of instructional material produced commercially may be obtained from various bookstores or fixed-base operators engaged in flight training. For subject areas where government publications have limited study material for certain categories of aircraft, commercially produced publications may be desirable.

## AIRCRAFT CATEGORIES

To determine the applicable aircraft category for each question, refer to the question number in the following list.

| *Item* | *Aircraft* | *Item* | *Aircraft* | *Item* | *Aircraft* | *Item* | *Aircraft* |
|---|---|---|---|---|---|---|---|
| **3001.** | ALL | **3044.** | AIR, RTC | **3087.** | ALL | **3130.** | ALL |
| **3002.** | ALL | **3045.** | GLI | **3088.** | ALL | **3131.** | ALL |
| **3003.** | ALL | **3046.** | ALL | **3089.** | ALL | **3132.** | ALL |
| **3004.** | ALL | **3047.** | AIR, RTC | **3090.** | ALL | **3133.** | ALL |
| **3005.** | ALL | **3048.** | ALL | **3091.** | ALL | **3134.** | ALL |
| **3006.** | ALL | **3049.** | AIR, RTC | **3092.** | ALL | **3135.** | AIR, RTC |
| **3007.** | ALL | **3050.** | AIR, RTC | **3093.** | ALL | **3136.** | AIR, RTC |
| **3008.** | AIR, RTC | **3051.** | AIR, RTC | **3094.** | GLI | **3137.** | AIR, RTC |
| **3009.** | AIR, RTC | **3052.** | AIR | **3095.** | GLI | **3138.** | AIR, RTC |
| **3010.** | ALL | **3053.** | AIR | **3096.** | GLI | **3139.** | ALL |
| **3011.** | ALL | **3054.** | ALL | **3097.** | GLI | **3140.** | ALL |
| **3012.** | ALL | **3055.** | AIR | **3098.** | GLI | **3141.** | ALL |
| **3013.** | ALL | **3056.** | AIR | **3099.** | GLI | **3142.** | ALL |
| **3014.** | ALL | **3057.** | ALL | **3100.** | GLI | **3143.** | ALL |
| **3015.** | ALL | **3058.** | ALL | **3101.** | GLI | **3144.** | ALL |
| **3016.** | GLI | **3059.** | ALL | **3102.** | GLI | **3145.** | ALL |
| **3017.** | AIR | **3060.** | ALL | **3103.** | GLI | **3146.** | AIR, RTC |
| **3018.** | HLC | **3061.** | ALL | **3104.** | GLI | **3147.** | AIR, RTC |
| **3019.** | GYR | **3062.** | ALL | **3105.** | GLI | **3148.** | AIR, RTC |
| **3020.** | GLI | **3063.** | ALL | **3106.** | GLI | **3149.** | AIR, RTC |
| **3021.** | AIR | **3064.** | ALL | **3107.** | GLI | **3150.** | AIR, RTC |
| **3022.** | ALL | **3065.** | ALL | **3108.** | GLI | **3151.** | AIR, RTC |
| **3023.** | ALL | **3066.** | ALL | **3109.** | ALL | **3152.** | AIR, RTC |
| **3024.** | ALL | **3067.** | ALL | **3110.** | ALL | **3153.** | AIR, RTC |
| **3025.** | ALL | **3068.** | ALL | **3111.** | ALL | **3154.** | AIR, RTC |
| **3026.** | AIR, RTC | **3069.** | ALL | **3112.** | ALL | **3155.** | AIR, RTC |
| **3027.** | AIR, RTC | **3070.** | ALL | **3113.** | ALL | **3156.** | ALL |
| **3028.** | AIR, RTC | **3071.** | ALL | **3114.** | ALL | **3157.** | ALL |
| **3029.** | AIR, RTC | **3072.** | ALL | **3115.** | ALL | **3158.** | ALL |
| **3030.** | AIR, RTC | **3073.** | ALL | **3116.** | ALL | **3159.** | ALL |
| **3031.** | AIR | **3074.** | ALL | **3117.** | ALL | **3160.** | ALL |
| **3032.** | AIR, RTC | **3075.** | ALL | **3118.** | ALL | **3161.** | ALL |
| **3033.** | AIR | **3076.** | ALL | **3119.** | ALL | **3162.** | ALL |
| **3034.** | AIR | **3077.** | ALL | **3120.** | ALL | **3163.** | ALL |
| **3035.** | HLC | **3078.** | ALL | **3121.** | ALL | **3164.** | ALL |
| **3036.** | GYR | **3079.** | ALL | **3122.** | ALL | **3165.** | ALL |
| **3037.** | ALL | **3080.** | ALL | **3123.** | ALL | **3166.** | ALL |
| **3038.** | AIR, RTC | **3081.** | ALL | **3124.** | ALL | **3167.** | ALL |
| **3039.** | AIR | **3082.** | ALL | **3125.** | ALL | **3168.** | ALL |
| **3040.** | AIR | **3083.** | ALL | **3126.** | ALL | **3169.** | ALL |
| **3041.** | HLC | **3084.** | ALL | **3127.** | ALL | **3170.** | ALL |
| **3042.** | GYR | **3085.** | ALL | **3128.** | ALL | **3171.** | ALL |
| **3043.** | GLI | **3086.** | ALL | **3129.** | ALL | **3172.** | ALL |

| *Item* | *Aircraft* | *Item* | *Aircraft* | *Item* | *Aircraft* | *Item* | *Aircraft* |
|---|---|---|---|---|---|---|---|
| **3173.** | ALL | **3216.** | AIR, GLI | **3259.** | HLC | **3302.** | HLC |
| **3174.** | ALL | **3217.** | AIR, GLI | **3260.** | RTC | **3303.** | HLC |
| **3175.** | ALL | **3218.** | AIR, GLI | **3261.** | RTC | **3304.** | AIR |
| **3176.** | ALL | **3219.** | AIR | **3262.** | RTC | **3305.** | AIR |
| **3177.** | ALL | **3220.** | AIR | **3263.** | RTC | **3306.** | AIR, GYR, GLI |
| **3178.** | ALL | **3221.** | GLI | **3264.** | ALL | **3307.** | ALL |
| **3179.** | ALL | **3222.** | AIR | **3265.** | ALL | **3308.** | AIR |
| **3180.** | ALL | **3223.** | AIR | **3266.** | RTC | **3309.** | ALL |
| **3181.** | ALL | **3224.** | AIR | **3267.** | AIR, GYR | **3310.** | ALL |
| **3182.** | AIR, RTC | **3225.** | AIR, GLI | **3268.** | AIR, GYR | **3311.** | ALL |
| **3183.** | AIR, RTC | **3226.** | AIR, GLI | **3269.** | AIR | **3312.** | ALL |
| **3184.** | AIR, RTC | **3227.** | AIR, GLI | **3270.** | AIR, RTC | **3313.** | ALL |
| **3185.** | AIR, RTC | **3228.** | AIR, GLI | **3271.** | AIR, RTC | **3314.** | ALL |
| **3186.** | AIR, RTC | **3229.** | AIR | **3272.** | AIR, RTC | **3315.** | ALL |
| **3187.** | AIR, RTC | **3230.** | AIR | **3273.** | RTC | **3316.** | ALL |
| **3188.** | AIR | **3231.** | AIR, GLI | **3274.** | RTC | **3317.** | ALL |
| **3189.** | ALL | **3232.** | AIR, GLI | **3275.** | HLC | **3318.** | ALL |
| **3190.** | ALL | **3233.** | AIR, GLI | **3276.** | AIR, GYR | **3319.** | ALL |
| **3191.** | ALL | **3234.** | AIR, GLI | **3277.** | GLI | **3320.** | AIR, HLC |
| **3192.** | AIR, RTC | **3235.** | AIR, GLI | **3278.** | GLI | **3321.** | AIR, HLC |
| **3193.** | ALL | **3236.** | AIR, GLI | **3279.** | GLI | **3322.** | AIR |
| **3194.** | AIR, RTC | **3237.** | AIR, GLI | **3280.** | AIR | **3323.** | AIR |
| **3195.** | AIR | **3238.** | AIR, GLI | **3281.** | AIR, GLI | **3324.** | AIR |
| **3196.** | AIR, RTC | **3239.** | AIR, GLI | **3282.** | AIR, GLI | **3325.** | AIR |
| **3197.** | AIR, RTC | **3240.** | AIR, GLI | **3283.** | AIR | **3326.** | AIR |
| **3198.** | AIR, RTC | **3241.** | AIR, GLI | **3284.** | AIR | **3327.** | AIR |
| **3199.** | AIR, HLC | **3242.** | AIR, GLI | **3285.** | AIR | **3328.** | AIR |
| **3200.** | ALL | **3243.** | AIR, GLI | **3286.** | AIR | **3329.** | AIR |
| **3201.** | ALL | **3244.** | AIR, GLI | **3287.** | AIR | **3330.** | AIR |
| **3202.** | ALL | **3245.** | AIR | **3288.** | AIR | **3331.** | AIR |
| **3203.** | ALL | **3246.** | AIR | **3289.** | AIR | **3332.** | AIR |
| **3204.** | AIR | **3247.** | AIR | **3290.** | AIR | **3333.** | ALL |
| **3205.** | ALL | **3248.** | AIR | **3291.** | AIR | **3334.** | AIR |
| **3206.** | AIR, GLI | **3249.** | AIR | **3292.** | AIR, GLI | **3335.** | AIR, RTC |
| **3207.** | AIR, GLI | **3250.** | AIR | **3293.** | AIR | **3336.** | AIR, RTC |
| **3208.** | AIR, GLI | **3251.** | AIR | **3294.** | AIR | **3337.** | AIR, RTC |
| **3209.** | AIR | **3252.** | GYR | **3295.** | AIR, GLI | **3338.** | AIR, RTC |
| **3210.** | AIR | **3253.** | RTC | **3296.** | AIR | **3339.** | AIR |
| **3211.** | ALL | **3254.** | RTC | **3297.** | AIR | **3340.** | AIR |
| **3212.** | ALL | **3255.** | RTC | **3298.** | AIR | **3341.** | AIR |
| **3213.** | AIR, GLI | **3256.** | HLC | **3299.** | AIR, GLI | **3342.** | AIR, RTC |
| **3214.** | AIR, GLI | **3257.** | HLC | **3300.** | AIR, GLI | **3343.** | AIR, GYR |
| **3215.** | AIR, GLI | **3258.** | RTC | **3301.** | HLC | **3344.** | AIR, GYR |

| *Item* | *Aircraft* |
|---|---|
| **3345.** | AIR, RTC |
| **3346.** | AIR, RTC |
| **3347.** | AIR, HLC |
| **3348.** | GLI |
| **3349.** | GLI |
| **3350.** | GLI |
| **3351.** | HLC |
| **3352.** | GYR |
| **3353.** | RTC |
| **3354.** | HLC |
| **3355.** | HLC |
| **3356.** | HLC |
| **3357.** | HLC |
| **3358.** | HLC |
| **3359.** | AIR |
| **3360.** | AIR |
| **3361.** | AIR |
| **3362.** | AIR |
| **3363.** | AIR |
| **3364.** | AIR |
| **3365.** | AIR |
| **3366.** | AIR |
| **3367.** | AIR |
| **3368.** | AIR |
| **3369.** | AIR |
| **3370.** | AIR |
| **3371.** | AIR |
| **3372.** | AIR |
| **3373.** | AIR |
| **3374.** | AIR |
| **3375.** | AIR, GLI |
| **3376.** | AIR |
| **3377.** | AIR |
| **3378.** | AIR, GLI |
| **3379.** | AIR, GLI |
| **3380.** | AIR, GLI |
| **3381.** | AIR, GLI |
| **3382.** | AIR |
| **3383.** | AIR |
| **3384.** | AIR |
| **3385.** | AIR, RTC |
| **3386.** | AIR |
| **3387.** | AIR, GLI |
| **3388.** | AIR |
| **3389.** | AIR |
| **3390.** | AIR |
| **3391.** | AIR, GLI |
| **3392.** | AIR |
| **3393.** | AIR |
| **3394.** | AIR, RTC |
| **3395.** | AIR |
| **3396.** | AIR, GLI |
| **3397.** | AIR, GLI |
| **3398.** | AIR, GLI |
| **3399.** | AIR |
| **3400.** | AIR, GLI |
| **3401.** | GLI |
| **3402.** | GLI |
| **3403.** | GLI |
| **3404.** | GLI |
| **3405.** | GLI |
| **3406.** | GLI |
| **3407.** | GLI |
| **3408.** | GLI |
| **3409.** | GLI |
| **3410.** | GLI |
| **3411.** | GLI |
| **3412.** | GLI |
| **3413.** | GLI |
| **3414.** | GLI |
| **3415.** | GLI |
| **3416.** | GYR |
| **3417.** | HLC |
| **3418.** | HLC |
| **3419.** | HLC |
| **3420.** | HLC |
| **3421.** | HLC |
| **3422.** | HLC |
| **3423.** | RTC |
| **3424.** | HLC |
| **3425.** | HLC |
| **3426.** | HLC |
| **3427.** | HLC |
| **3428.** | RTC |
| **3429.** | HLC |
| **3430.** | HLC |
| **3431.** | GYR |
| **3432.** | HLC |
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| **3446.** | HLC |
| **3447.** | HLC |
| **3448.** | HLC |
| **3449.** | RTC |
| **3450.** | HLC |
| **3451.** | ALL |
| **3452.** | ALL |
| **3453.** | AIR, RTC |
| **3454.** | ALL |
| **3455.** | ALL |
| **3456.** | ALL |
| **3457.** | AIR |
| **3458.** | AIR |
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| **3477.** | AIR |
| **3478.** | AIR |
| **3479.** | AIR, GLI |
| **3480.** | AIR |
| **3481.** | AIR |
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| **3495.** | AIR |
| **3496.** | AIR |
| **3497.** | AIR |
| **3498.** | AIR |
| **3499.** | AIR |
| **3500.** | HLC |
| **3501.** | HLC |
| **3502.** | HLC |
| **3503.** | HLC |
| **3504.** | ALL |
| **3505.** | ALL |
| **3506.** | ALL |
| **3507.** | ALL |



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